Rock Products

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Erection of a 4000-Ton Crushing Plant in 50 Working Days

Dundas Plant of the Canada Crushed Stone Corporation Burned April 29, 1922, and Entirely Rebuilt and Ready for Operation June 26 Following—An Up-to-the-Minute Steel and Concrete Plant

By Gordon Smith
J. C. Buckbee Co., Engineers, Chicago, Ill.

ABOUT the first of April, 1922, the crushing plant of the Canada Crushed Stone Corporation, Ltd., at Dundas, Ontario, was closed down for the making of repairs and the installation of some new equipment. The plant as then constituted is shown in Fig. 1, a picture which was taken in February, 1921. During the fall of that year the towers in the foreground supporting the distributing belt conveyor over the storage pile were replaced with new ones straddling the pile and this conveyor doubled in length.

Rock from the quarry was delivered on the steel trestle shown in the upper left-hand corner in 4-yd. 36-in. gage cars and dumped into a 42-in. double discharge McCully crusher. The product of this crusher was handled by two armored, inclined belt conveyors to 72x30-in. Garfield rolls which, with the motor driving them, were housed in the timber building shown directly in front of and below the primary crusher.

The recrushed material from these rolls was then carried on 30-in. belt conveyors in wooden galleries on timber bents to the screen house, also of timber construction, where the sizing was done by four 48 in. by 28-ft. revolving screens. Oversize from these screens was recrushed by 54x24 in. Superior rolls located in a lean-to behind the concrete substructure of the bins. The rolls discharged into a continuous vertical belt and bucket elevator which returned the recrushed material to the screens for resizing.

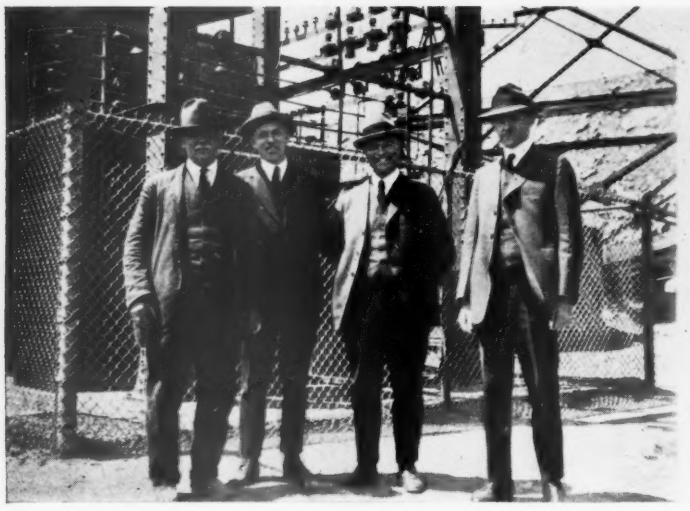
The improvements, which were put in under the direction of and according to plans prepared by the J. C. Buckbee Co., engineers, of Chicago, who also prepared the plans for the original plant built in 1910, consisted in the rearrangement of the 54-in. roll house and the installation of a pulverizer for making agricultural limestone, the addition of four 7x12 ft. shaking screens, the reinforcing of the old wooden bins with steel sections and the replacing of the existing elevator handling the product of the 54-in. rolls with inclined belt conveyors in steel galleries, a transfer tower and agricultural stone bin being located about 135 ft. east of the screen house.

C. M. Doolittle, president and general manager, Canada Crushed Stone Corp., Ltd.

These improvements and additions and a general overhauling of the plant were almost completed in the month of April, except for the erection of the inclined galleries and agstone building, the work being under the immediate charge of George Gruhl, superintendent, and A. G. Mackay, resident engineer. On Saturday afternoon, April 29, men were working on the spouts to the new shaking screens and using an acetylene welding and cutting outfit.

In some manner a piece of molten metal fell into one of the bins and set fire to a partition wall. The screenhouse, bins, conveyor galleries, and 72-in. roll house were in ashes in the short space of 20 minutes! Figs. 2, 3, and 4, taken the following Monday, are vivid evidence of the devastation. The rapidity with which the fire spread through the buildings was remarkable.

Mr. Gruhl, supervising the work on the shaker spouts, directly over the bins, hurried upstairs to get the fire hose kept on the revolving screen floor above, but the flames drove him out. His only avenue of escape was through the conveyor galleries, set at a slight incline leading up to the 72-in. roll house. In running along one of these galleries, the back of his head and ears were badly burned! The rest of the men working on the spouts escaped down a ladder outside the bins and as the last man came down, the top rungs of the lad-



Left to right—George Gruhl, superintendent; R. W. Cunningham, purchasing agent; R. G. L. Harstone, sales manager; A. G. Mackay, plant manager

J. B. Hart, secretary

der were in flames! The spread of the fire with such speed was undoubtedly due to a very strong wind and the inclined conveyor galleries, which, each about 6 ft. square inside and 140 ft. long, acted as enormous flues.

Fig. 2 shows the ruins of the 72-in. roll house with the walls supporting the 42-in. crusher to the right. The rolls were not completely destroyed, but they had to be completely overhauled and rebabbitted. The rope drive was lost of course and the

was burned out. The storage system is shown clearly in the middle foreground of this illustration, with the town of Dundas and valley in the background.

Fig. 4 was taken from the storage pile level, the track by the 42-in. crusher being about 250 ft. above the camera. A good view is obtained in this picture of the primary crusher and trestle leading thereto. The quarry is on top of the hill and to the left, or west, of the crusher. The cars in the foreground are on the

fire until the west half was put in operation was a startling feat made possible only by the hearty co-operation of all concerned.

The fire occurred between 4:00 and 4:30 in the afternoon of Saturday, April 29. By 6:00 p. m. of the same day the insurance companies had been notified of the loss, an adjuster agreed upon, who arrived the next morning and admitted a total loss, and arrangements had been made with the Hamilton Bridge Works Co. for

Fig. 1—The plant before the fire, February, 1921

Fig. 2—The ruins of the 72-in. roll house, May 1, 1922

250-hp. motor driving the rolls had to be completely rewound. The feeding conveyors for these rolls were destroyed. Fig. 3 shows the remains of the conveyor galleries and screen house, with the wrecking crane at the left.

The revolving screens and the new shakers were a total loss as well as all the new steel work used in reinforcing the wooden bins. The storage system with the new towers and extension was practically undamaged except for the loading end of the conveyor at the plant which

Grand Trunk main line tracks. To the left of the crusher may be seen the building housing a hoist used in pulling supplies up to the quarry and shops on top, along an inclined track which connects with the main siding some 3200 ft. to the west. To the right, or east, of the crusher is the transformer house and substation. This picture also affords a very good view of the construction details of the spread-leg towers for the storage conveyor.

The rebuilding of this plant in the space of 50 working days from the date of the

the use of a wrecking crane which arrived on the scene on Monday.

By midnight C. M. Doolittle, president of the Canada Crushed Stone Corporation, Ltd., was in telephone communication with J. C. Buckbee in Chicago in regard to plans for rebuilding the plant. Having in their files all of the drawings for the original plant and being thoroughly familiar with the requirements of the company, he and his forces were enabled to prepare preliminary plans for the new plant in record time. Mr. Buckbee ar-

Fig. 3—The remains of the galleries and screen house

Fig. 4—The primary crusher and the trestle leading thereto

rived in Dundas the following Tuesday morning with blueprints.

The new plans called for rebuilding entirely of concrete and steel and after a conference with the operating staff and their approval of the plans, a directors' meeting was called, the plans approved and instructions issued to proceed with the work with the greatest possible speed.

The first consideration of the directors at this meeting was that nothing be left undone to protect the large number of contracts which the company had made and to bend every effort and spare no expense in order to be operating as soon as possible.

A conference was held on the same day with representatives of the Hamilton Bridge Works Co. and the Russell Construction Co. of Toronto in regard to the buildings and they were instructed to proceed with the steel buildings and concrete work respectively. Mr. Buckbee then prepared a schedule of what *could be done* in the way of speed, which schedule forms the basis of the reconstruction schedule shown as Fig. 5 and which was prepared

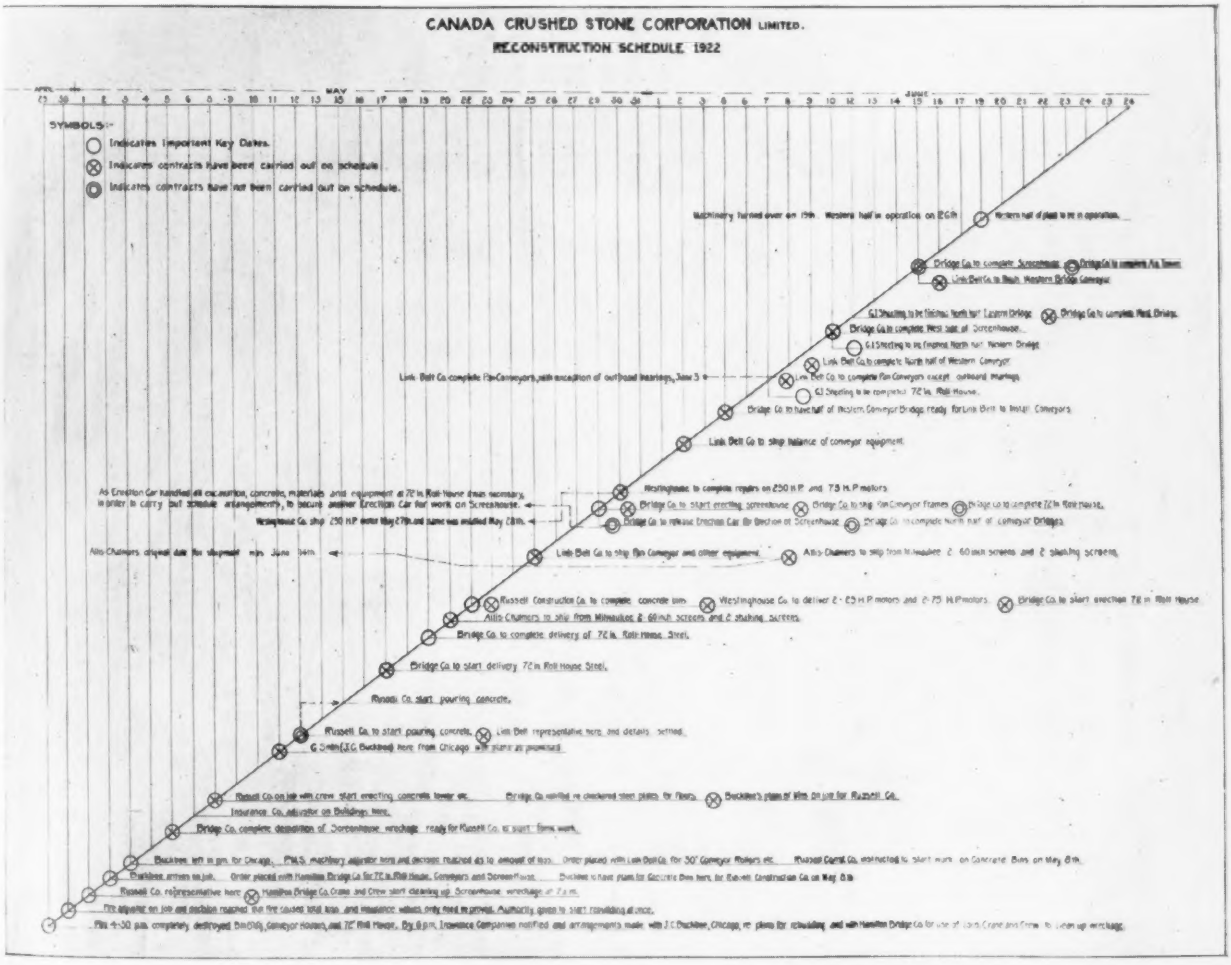

CANADA CRUSHED STONE CORPORATION LIMITED.
RECONSTRUCTION SCHEDULE 1922
APRIL
MAY
JUNE
SYMBOLS:-
Indicates Important Key Dates.
Indicates contracts have been carried out on schedule.
Indicates contracts have not been carried out on schedule.
Machinery turned over on 15th. Western half in operation on 22nd.
Western half of plant to be in operation.
Bridge Co. to complete Screenhouse.
Bridge Co. to complete Ash Tower.
Link Belt Co. to finish Western Bridge Conveyor.
Bridge Co. to complete West Side of Screenhouse.
Link Belt Co. to complete North half of Western Conveyor.
Link Belt Co. to complete Pan Conveyors except outboard bearings.
Bridge Co. to have half of Western Conveyor Bridge ready for Link Belt to install Conveyors.
Link Belt Co. to ship balance of conveyor equipment.
Bridge Co. to complete delivery of 72' in. Roll House Steel.
Bridge Co. to start delivery 72' in Roll House Steel.
Russell Co. start pouring concrete.
Russell Co. to start pouring concrete.
Bridge Co. complete demolition of Screenhouse wreckage ready for Russell Co. to start form work.
Bridge Co. to start erection 72' in Roll House.

Fig. 5—The reconstruction schedule. The circled dates comprised the goal for which everyone strove

by Messrs. Harstone and Mackay of the Canada Crushed Stone Co. The circled dates on that schedule comprised the goal for which every one strove.

How well they succeeded is best shown by the chart itself. The Russell Construction Co. completed the bins on time, their forces working night and day and pouring a total of over 7420 cu. yd. of reinforced concrete. The Hamilton Bridge Works Co. detailed, fabricated and erected all of the steel work on schedule, a total of over 400 tons. The several machinery manufacturers whose names appear on the chart anticipated or met all delivery promises exacted by the engineers and Mr. Doolittle.

The credit for this achievement cannot be placed. It belongs to Mr. Doolittle, who "led the procession" and saw to it that no one lagged; to Mr. Buckbee who said: "It can be done, now do it;" to Mr. Gruhl and Mr. Mackay and the others of the company's forces who worked night and day setting machinery, pouring foundations and taking care of the hundred odd bits of work which had to be done; to C. H. Marrs of the Hamilton Bridge Works Co. and his men, who detailed and fabricated the steel work; to Andy Hays, who erected the steel work and set 60-in. screens with a crane boom 2 ft. too short! The west half of the plant was turned over on June 19 and put into operation on June 26. The other half followed as rapidly as possible and a total of over 275,000 tons of crushed stone was produced in 1922, up to December 1, in spite of a shutdown time of three months, and only a partial operation during two more months and a disastrous fire.

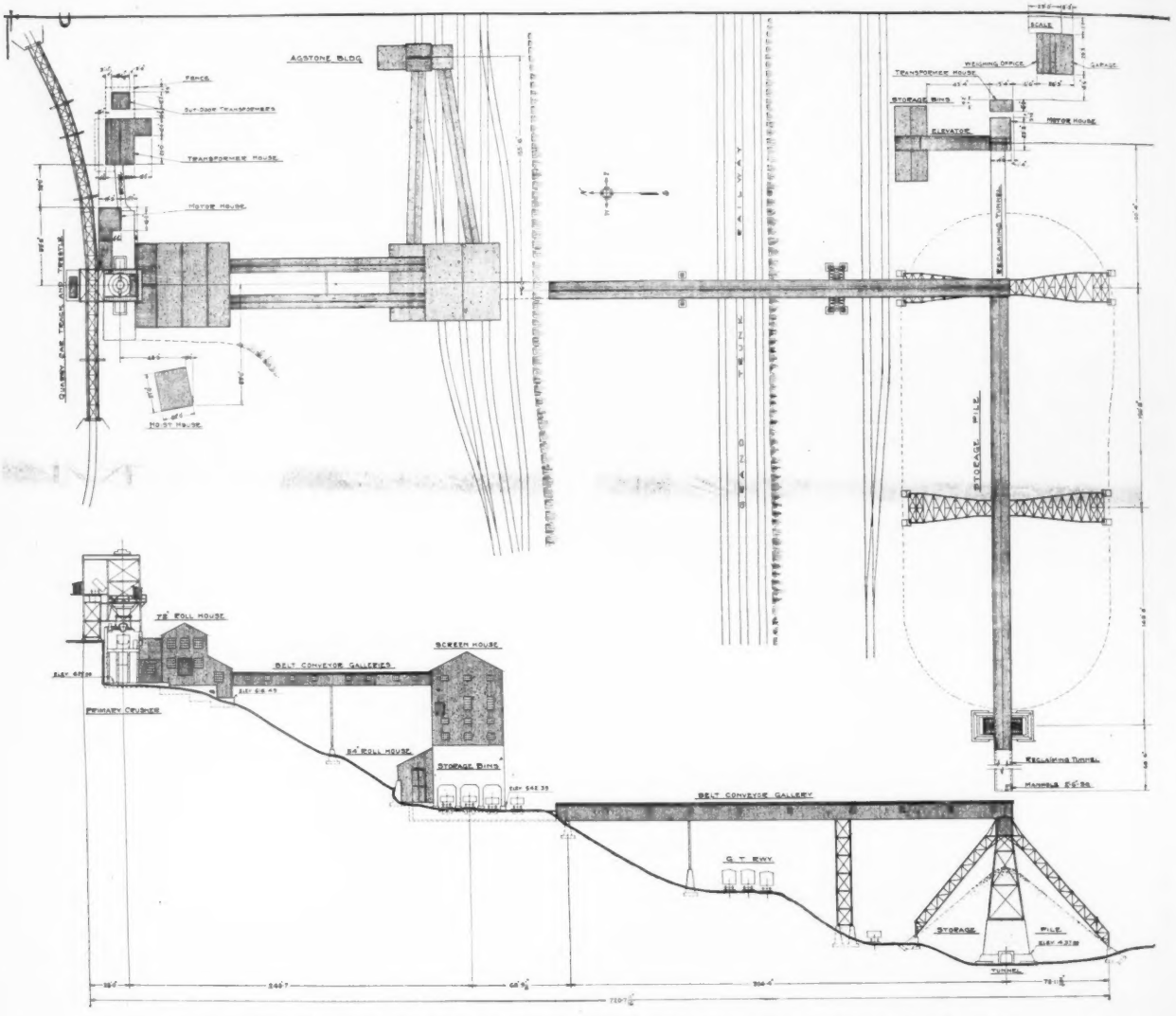


Fig. 11—The design of the plant of the Canada Crushed Stone Corp., Ltd., at Dundas, Ont.

The New Plant

The new plant, rebuilt of concrete and steel throughout after the fire as previously described, is one of the most complete and modern plants in North America. It is located on the main line of the Grand Trunk railway just east of Dundas, Ontario, about 5 miles from Hamilton and about 37 miles from Toronto, which markets it serves. The valley formed by the two sides of the Niagara escarpment is about 3 miles wide at this point, the quarry and plant being on the north side. The quarry is on top of the hill and the plant so arranged that no elevating machinery is necessary.

The main line of the Grand Trunk runs along the side of the hill about one-fourth the way up to Elevation 481 (see Fig. 11). Above these tracks are the loading bins and tracks at Elevation 542, while at the top of the hill is the primary crusher and quarry car tracks at Elevation 691. Below the main line and skirting the edge of the town is the storage pile and tracks for loading from stock at about Elevation 447. The total drop from the track past

THESE PICTURES SHOW THE PROGRESS OF THE WORK

Fig. 6—The progress up to May 8

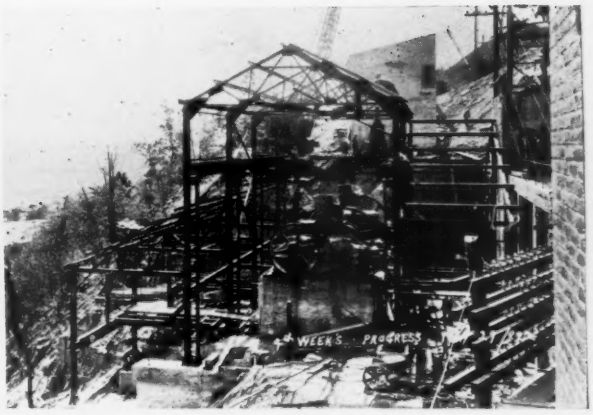


Fig. 7—At the fourth week, May 29

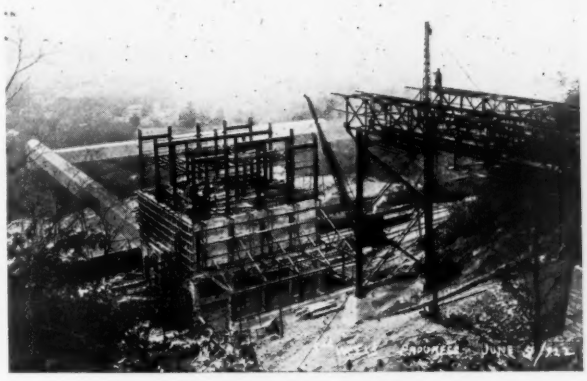


Fig. 8—At the fifth week, June 5

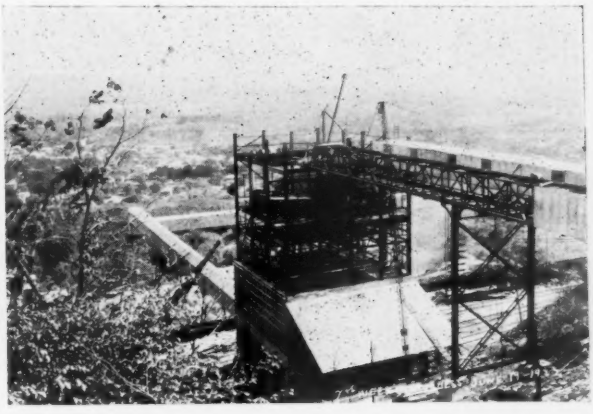


Fig. 9—The seventh week's progress, June 19

the big crusher to the floor of the stock pile is about 250 ft.

The quarry is to the west and north of the primary crusher. Three shovels are operated; one Bucyrus Model 100-C and two Marion Model 91, all with 3½-yd. buckets. These shovels work about 25 ft. faces and load 4-yd. 36-in. gage side dump cars. The shovels are all on railroad trucks. A typical view in the quarry is shown in Fig. 13. The quarry is about 600x1000 ft. in extent.

The drilling is done by 10 Cyclone well drills. Stripping is about 12 ft. deep and is handled with a Thew revolving electric shovel. The material is loaded in 4-yd. dump cars and is disposed of by filling in a ravine about 500 ft. to the west of the quarry.

Well-equipped shops and adequate storehouses, together with the plant office and officers' dining room, are located on top of the hill. Supplies are delivered on this level by means of an inclined track connecting with the Grand Trunk about 3200 ft. to the west. This inclined supply track is about 1200 ft. long and on about a 16 per cent grade. Fig. 14 shows a string of quarry cars at the primary crusher, and the supply track and hoist

Fig. 10—The fifth week's progress—June 5

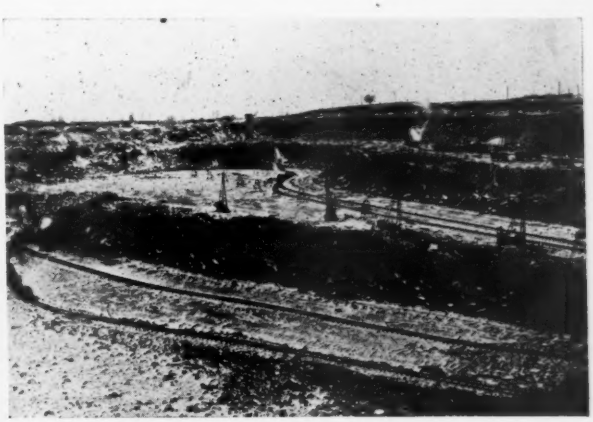


Fig. 13—This is a typical view of the quarry

Fig. 14—A string of cars is shown at the primary crusher. The supply track and hoist house appear in the foreground

house may be seen in the foreground.

The primary crusher is a Mammoth McCully with double discharge having a 42x136-in. opening. It is driven by a 250-hp. Westinghouse motor with English system rope drive. This crusher is surrounded by a steel framework carrying the car-dumping device, a hoist for clearing bridges at the crusher and a 40-ton overhead crane for handling crusher repairs and parts. The quarry tracks are carried past the crusher on a steel trestle (see Fig. 14).

This crusher is set high on concrete foundations and discharges into two concrete bins from which the product is fed to two Link-Belt apron conveyors. These are 30 in. wide with ¼-in. thick bottom plates and ⅜x9-in. high side plates, carried on a steel framework by a 12-in. pitch steel chain. These feeders, which are 32 ft. centers, are driven by steel roller chain from the main shaft of the 72x30-in. Garfield rolls to which they deliver. Clutches are provided on the countershaft for control of the feeders independent of the roll operation. The two 72x30-in. rolls are driven by one 250-hp. Westinghouse motor with English system rope drives. Figs. 15 and 16 show respectively the rolls and the apron conveyors. The roll house is of steel throughout, with corrugated sides and roof, steel sash and checkered steel plate floors. A 20-ton crane and runway are provided in this building serving these rolls.

The product of each of the rolls is delivered to a 30-in. horizontal belt conveyor of about 330-ft. centers running at 300 f.p.m. These conveyors are carried in covered steel galleries, with checkered plate floors, corrugated steel sides and roof, well lighted by steel sash windows. Each gallery has a span of 142 ft., supported at the center by a steel bent, the north end of the gallery resting upon supports at the 72-in. roll house and the south end being carried on the top floor of the screen house.

The conveyors discharge into dividing head boxes feeding four 60-in. by 25-ft. Allis-Chalmers revolving screens with 11-ft. dust jackets. Below each revolving screen is a 7x12-ft. double-deck Allis-Chalmers compensated shaking screen, which receives and sizes all material passing the dust jackets of the revolving

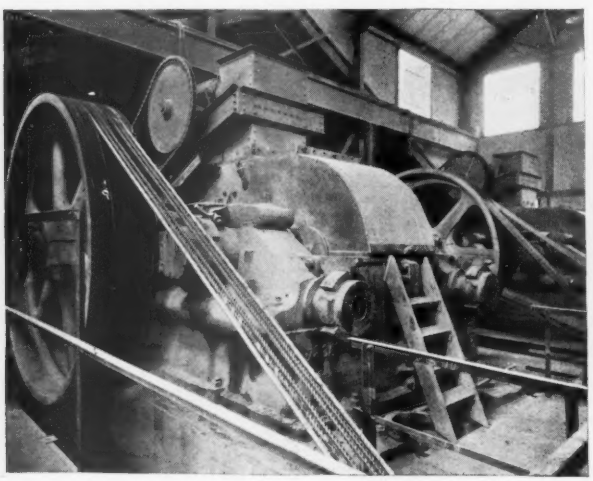


Fig. 15—The 72x30-in. rolls, showing rope drives

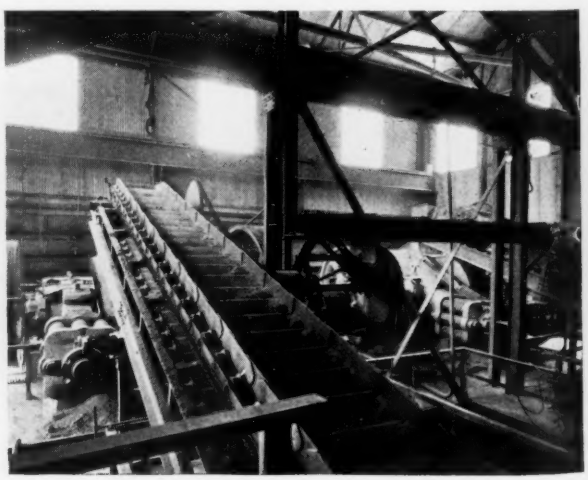


Fig. 16—30x9-in. apron conveyors feeding 72x30-in. rolls

Fig. 17—The conveyor floor. Note the steel construction, completely enclosed machinery and excellent lighting

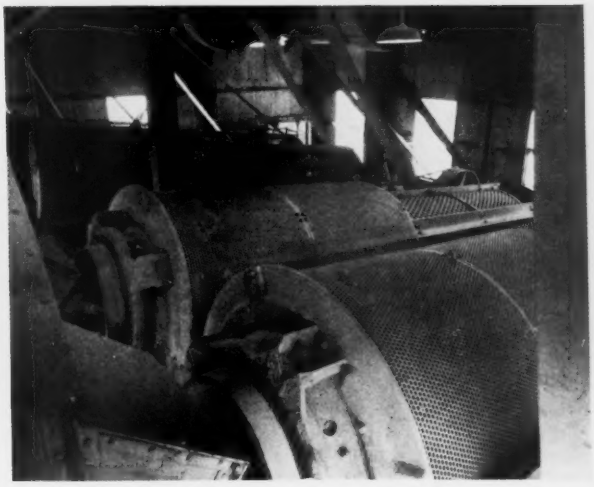


Fig. 18—A pair of the 60-in. screens, showing a portion of the steel head box and feed spouts

screens. Two 75-hp. Westinghouse motors drive the screens and belt conveyors, through lineshafts, the drive being arranged so that each motor drives one-half the plant. Each screen and conveyor is driven through a clutch so that any piece of machinery may be stopped and started independently of the others.

The screen house is carried on top of the reinforced concrete bins, is about 50 ft. square and over 90 ft. high above the loading tracks to the eave line. Steel construction is used throughout with checkered steel plate floors, corrugated steel sides and roof, and steel sash. All screen baffle plates and chutes are of steel as well as the screen supports, the only wood used in the entire plant being the screen timbers, timbers under the motors and the sleepers carrying the belt conveyor stands. Fig. 17 was taken on the conveyor floor looking north down one gallery; it gives a good idea of the steel floor construction, complete enclosure of all machinery and belts by steel guard rails and the well lighted building. Fig. 18 shows a pair of the 60-in. screens with a portion of the steel head box and feed spouts at the left. Trolleys are provided over each screen for handling repair parts and changing sections. Fig. 19 is a view of the discharge end of the shakers and shows the substantial construction of the discharge spouts.

The loading bins are 52x50 ft. outside dimensions and entirely constructed of reinforced concrete. Their capacity is about 2100 tons water measure and they span three loading tracks with a fourth or run-around track to the south. All spouts to these bins are of steel with renewable plates wherever subject to wear and are hung from the screen floors. Oversize and 2-in. stone are stored in the north row of bins and on this side is located the recrushing plant. This is a steel and concrete building; the present equipment consists of one set of 54x24 in. Superior rolls and one No. 15 American ring pulverizer. These are fed from the bins by short apron feeders and provision was made in the design of this building to accommodate additional units should they be desired.

From the recrushing plant to the east runs an inclined gallery carrying a 30-in. belt conveyor taking the products of the recrushing plant to the agstone building situated at a distance of 155 ft. 6 in. (see Fig. 11). Here the stone may be diverted to a second 30-in. conveyor inclined and leading back to the screen house, where it discharges into a dividing head box and spouts which distribute evenly to all four revolving screens. Any portion or all of the stone may be passed over a Sturtevant Bucking Broncho screen, the oversize going to the second conveyor and thence to the screenhouse and the fines to the agstone bin over the loading track.

To the north of the bin and cutting into the hillside is a sacking room 15x20 ft.

Fig. 19—The discharge end of the shakers, showing the substantially constructed discharge spouts

Fig. 20—General view showing the horizontal and inclined conveyor galleries

for handling, storing and shipping agricultural limestone and other fine products, for which this company is developing an active market, being the first concern in Ontario to go after such business on a large scale.

Beneath the loading tracks under the screenhouse bins in a concrete tunnel is a reversible 24-in. conveyor delivering either to the storage system conveyor to the south or to the 30-in. conveyor under the crushing plant to the north, which

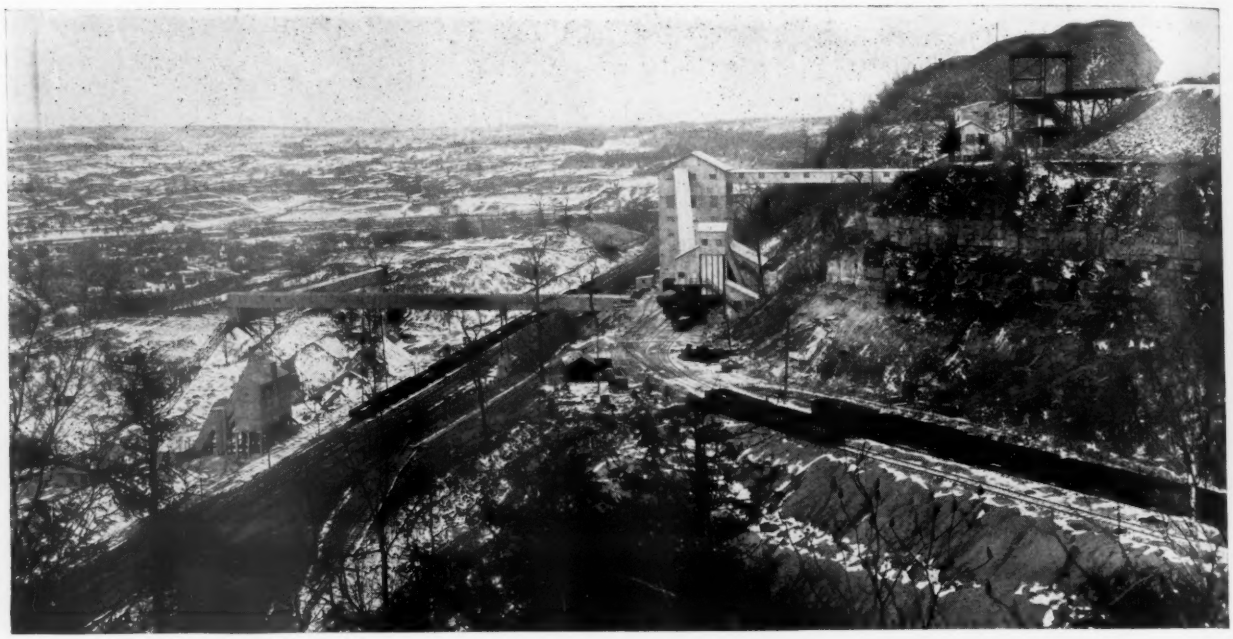


Fig. 21—A general view of the entire plant, including the storage system

delivers to the agstone building. This reversible conveyor is so arranged and spouts so provided that any size stone from the bins may be delivered to the storage system conveyor or to the conveyor leading to the agstone building. In addition stone may be brought in on the loading tracks from the stock pile in hopper cars and unloaded through the tracks to this reversible conveyor and returned to the plant for rescreening or recrushing as may be desired. This arrangement provides the utmost flexibility in the handling of stone of any and all sizes in whatever manner desired.

Fig. 20 is a view taken looking south toward the screen house. To the right are the galleries from the 72-in. roll house. In the center are the screen house, bins and recrushing building with the agstone building and inclined galleries to the left. The loading tracks and run-around track are clearly discernible. Figs 21 and 22 are general views of the entire plant, including the storage system, and give an idea of the magnitude of the company's operations.

The north and south gallery of the storage system which spans the main line tracks of the Grand Trunk is about 305 ft. long and carries a 24-in. belt conveyor. This conveyor discharges to a similar conveyor in the east and west gallery over the storage pile, about 320 ft. long. The pile is formed under this second gallery by means of a movable tripper. These galleries are of steel construction, with corrugated sides and roof and plank floors. The towers under the north and south section spanning the tracks are square, while those supporting the gallery over the pile are of the spread-leg variety, keeping the steel legs clear of the stone. The floor of the gallery is about 80 ft. above the ground under the pile and the gross capacity of the stock pile is about 150,000 tons.

Reclaiming is effected by means of a 24-in. conveyor in a concrete tunnel under the pile. Gates are placed every 20 ft. in the roof slab of the tunnel, delivering the stone by gravity to the belt conveyor inside. Tracks parallel the pile on the north side and a locomotive crane is used to either load cars direct from storage or operate an "Arrow" bottomless drag scraper for reclaiming through the tunnel the sides of the pile which are ordinarily "dead" storage. Fig. 23 shows the operation of this scraper.

The reclaiming conveyor delivers to an elevator at the storage pile loading bins (see Fig. 22). At this point are a No. 4 McCully crusher and a 60 in. by 20 ft. revolving screen with 10-ft. dust jacket so that if desired any or all of the material from the storage pile may be recrushed or rescreened before loading and in this manner meet any demands for stone that may be made when the balance of the plant is not in operation. In the immediate foreground of this picture are shown the garage and truck scales, with the loading bins and equipment to the right.

This plant is operated throughout, except haulage and shovels, by electric power which is purchased from the Dominion Power and Transmission Co. for the operation of crushing and screen equipment and from the Hydro-Electric Power Commission of Ontario for the operation of the equipment at the stockpile. The transformer station, metering equipment and switchboards are to the east of the primary crusher. All motors and lights are controlled from this central point, with emergency stopping devices at or near each motor and a system of bell signals for starting up.

The plant was designed entirely by the J. C. Buckbee Co., engineers, of Chicago, and built under their supervision, George Gruhl, superintendent, and A. G. Mackay, plant engineer, having immediate charge of the construction work. The Canada Crushed Stone Corporation has an enviable reputation as a producer of crushed stone and kindred products in its territory. Immense reserves of raw material, its new and modern plant and equipment, and its extensive storage system give it unusual facilities to serve its customers.

The quarry at Dundas was first opened in 1905 and was then operated under the firm name of Doolittle & Wilcox, Ltd. In 1912, after the death of Mr. Wilcox, the company was reorganized as the Canada Crushed Stone Corporation, Ltd.

Fig. 23—This bottomless drag scraper reclaims the "dead" storage

C. M. Doolittle, the president and general manager, is well known in the stone industry, having served for a number of years as a director of the National Crushed Stone Association. W. J. Southam is vice-president and treasurer. The directors are Cyrus A. Birge, C. M. Doolittle, Brigadier-General Sir John M. Gibson, K. C. M. G., K. C., M. A.; W. C. Hawkins, G. H. Levy, Lieutenant-Colonel J. R. Moodie, W. J. Southam, C. S. Wilcox, A. V. Young and John E. Russell. The operating staff comprises J. B. Hart, secretary; George Gruhl, superintendent; A. G. Mackay, plant engineer; R. G. L. Harstone, sales manager, and R. D. Watson, traffic manager.

The products of this company are handled in Hamilton by the Doolittle-Russell Co., Ltd., which has recently opened a new supply yard there and carries a full line of builders' materials.

In Toronto and throughout the province the company's products are handled by the John E. Russell Co., Ltd., which maintains extensive storage yards in Toronto and a well-organized sales force throughout Ontario.

Characteristics of Fluxing Limestone

FLUXING limestone is usually prepared in sizes ranging from 2 to 7 in., states Dr. Oliver Bowles, mineral technologist of the Bureau of Mines. Open-hearth steel furnaces usually demand stone not less than 4 or 5 in. in size, but for blast furnaces smaller stone may be used.

Smelting companies that operate their own fluxing quarries may use stone as small as ¾ in. mixed in with the larger sizes, but where purchases are made from independent producers it is unlikely that sizes smaller than 2 in. would be acceptable. Thus 2- to 4-in. stone might be sold to blast furnaces in limited quantities, though a large amount of the small-sized stone would be undesirable when not mixed with the larger sizes. This use is limited not only by the demand but by transportation, for it is too low priced to justify a heavy haulage charge. Most limestone used for lime manufacture is well adapted chemically for fluxing uses, and a number of lime companies sell fluxing stone.

Foreign Phosphate Shipments Decreasing

WITH the exception of shipments to England, phosphate shipments from Egypt decreased, both Italy and Japan making much smaller purchases than in preceding years. France has not been in the market for Egyptian phosphate during the past two years and no phosphate has been sold to the United States.—*Commerce Reports.*

Fig. 22—Another view of the plant which gives an idea of the magnitude of the company's operations

Constitution of Portland Cement

First of a Series of Articles Summarizing Latest European Knowledge and Development

By J. L. Duchez, in the Revue des Materiaux de Construction et de Travaux Publics

Translated by C. S. Darling, formerly editor of Rock Products, now sales engineer, Pennsylvania Crusher Co., Chicago, Ill.

THE methods of making artificial portland cement have changed greatly in the last few years, to an extent that all theories accepted up to the present time have been put to doubt.

In 1921 the *Revue des Matériaux de Construction* and the magazine *le Ciment* published very interesting articles, signed by M. Bied and by M. Hendrickx, unfolding horizons altogether unknown concerning the nature of the constituents of cement, or, better, hydraulic cementing materials, and the manner in which they are formed following the accepted method of burning.

The studies of M. Bied on the "ciment fondu" [or fused cement, as we shall translate it—Editor], of which he is the inventor, have given a severe blow to the deductions of the more widely accepted investigators; and while many manufacturers do not yet wish to accept the evidence, we are persuaded that all those who read the article by M. Bied, "A Necessary Agency in the Cement Industry" (*Revue des Matériaux de Construction*, 1921) practical men as well as theoretical men must have considered very seriously the accuracy of the deductions of this student. The study of M. Hendrickx on clinkerization (*le Ciment*, 1921) remains without doubt the most complete work on the burning of artificial portland cement in the rotary kiln.

As M. Malphettes has indicated in his article, "New Progress in the Manufacture of Artificial Cement" (*R. M. C.*, 1921), the works of M. Le Châtelier are not yet undermined. The studies made by this investigator will remain for a long time a masterpiece and we do not believe there exists at the present time a more complete theoretical work on the crystallization of artificial portland cement. The work of M. Le Châtelier is 30 years old and in general the interpretations given of the results he obtained are presented with a precision which the investigator himself never foresaw.

Since 1914, the fixed kiln has developed rapidly, especially since the adaptation of automatic charging and drawing apparatus, and the question presents itself today as to whether it is not destined to replace entirely the rotary kiln in the manufacture of artificial cements obtained by incipient fusion.

M. Dumesnil has given in his article, "Observations on the Manufacture of Cement in Modern Vertical Kilns" (*R. M. C.*, 1920), a quite complete study of the different systems of these kilns actually known, but without certain exactitudes on the results of their operation.

The only factors compared by the different authors or engineers who have written on these two methods of burning have to do particularly with purely economic questions, leaving completely aside the questions of quality of product as well as those of the difficulties of manufacture resulting from the type of kiln adopted.

From the purely economic point of view, is not this question very much subject to discussion? If, before 1914, the fixed kiln seemed to offer real advantages from the point of view of economical construction, does it not also do so today, with iron and masonry advanced in price in varying proportions and with labor and power entering as factors at least as important as that of fuel consumption?

To establish an exact comparison between the two methods of burning, it is necessary not only that the discussion include more or less exact figures on fuel consumption, but that all cost figures from quarry to shipping station be considered, including plant for raw material preparation, and the putting into storage bins before sacking.

It remains evident that in the case of each system the comparison should be made on kilns provided with the most up-to-date methods of charging and drawing, and equipped also for waste heat recovery and its use in drying raw materials and coal and in the production of motive power.

Also—a very important point—account should be taken of the differences in quality of the resulting cements, which has a large influence on the commercial future of a business, if not upon the cost of production.

The reactions which are produced during the burning play a most important part in the discussion, for they are not always as simple as we like to believe when we show only the products of the reactions of the silica, alumina, and lime, according to the authors, at temperatures varying from 1350 to 1600 deg. C., without properly determining some of the new compounds which may be formed, or the manner in which they act according to the temperature of the laboratory or the kiln, or the method of cooling.

Constitution of Artificial Cements

A large number of specialists are occupied in solving the problem of the constitution of hydraulic cementing materials, but their conclusions differ sharply because of the difficulties which these researches present. We can classify the different opinions in the following manner:

1. Fuchs, Pettenkoffer, Rolland, etc., claim the existence in the cement, after burning, of a mixture of lime, of combinable silica, and of clay. During the hardening the silica combines with the free lime to form the silicate of lime SiO_2 CaO.

2. Berthier, Rivot, Chatonney, Zulkowsky, Fremy, Loebel, etc., claim there is produced, during the burning, a combination of the calcium and the silicic acid, in which the maximum quantity of lime corresponds to SiO_2 2CaO and that in the cement there exists always a portion of lime which is not chemically combined.

According to this theory, the object of the hydration would be to form calcium monosilicate, SiO_2 CaO, and calcium hydroxide, $Ca(OH)_2$, which gradually is transformed into calcium carbonate, $CaCO_3$.

Zulkowsky claims that parallel with the bicalcium silicate there is formed the mono or bicalcic aluminate, allowing the formula for cement to be expressed as:

$$x(SiO_2\ CaO)+y(Al_2O_3\ CaO)$$

or again:

$$x(SiO_2\ 2CaO)+y(Al_2O_3\ 2CaO)$$

The first of these formulas corresponds to that indicated by M. Bied

$$.25(SiO_2\ 2CaO)+Al_2O_3\ CaO$$

which has given, for the fused cements, excellent results.

Zulkowsky extracted the free lime from the cement with the aid of an alcoholic solution of potassium nitrate. Hart used an

alcoholic solution of potassium iodide and found 30 per cent free lime in the portland cement. Jordan and Kanter have shown that it must be almost impossible to proportion the lime in the wet process for all the silicates and aluminates of calcium were decomposed by the salt solutions, aqueous or alcoholic, with the liberating of hydrate of lime. Ostwald and Blank solve this problem by thermo-chemical determinations and show the probable presence of a small quantity of free lime in the cements.

Several authors, Americans in particular, agree that, parallel with the bicalcic silicate, there is formed a tri-calcic aluminate. Artificial portland cements might therefore correspond equally well to the following formulas:

$$x(SiO_2\,2CaO)+y(Al_2O_3\,3CaO)+zCaO$$

granting a small proportion of free lime in the cement, and

$$x(SiO_2\,2CaO)+y(Al_2O_3\,3CaO)$$

if we admit that the cement does not necessarily contain free lime.

3. Michaelis, Winkler, Le Châtelier, Newberry, Rebuffat, etc., claim that during the burning the total quantity of lime combines to form a silicate and an aluminate of lime, in which the maximum content of lime reaches three molecules. Newberry admits the tricalcic silicate, but only the bicalcic aluminate.

Here we have therefore two new formulas:

$$x(SiO_2\,3CaO)+y(Al_2O_3\,3CaO)$$

and Newberry's formula:

$$x(SiO_2\,3CaO)+y(Al_2O_3\,2CaO)$$

In his book, "Silica and Silicates," M. Le Châtelier concludes: "Whatever it may be, the indisputable fact remains that the essential element of all hydraulic products is a mixture or a compound of lime and silica, containing more than two molecules of lime for one of silica, very likely three molecules."

This restriction of M. Le Châtelier opens the door to an entirely new series of formulas of the form

$$x(SiO_2\,n\,CaO)+y(Al_2O_3\,3CaO)$$

in which the figure n must be between 2 and 3, and we arrive thus at M. Hendrickx' formula:

$$x(SiO_2\,2.5CaO)+y(Al_2O_3\,3CaO)$$

For a long time we have been prone to proportion on the basis of a lime content of the silicate between 2 and 3 molecules. In 1920, well before the appearance of M. Hendrickx' article, therefore, we indicated in a report addressed to M. Contal on the subject of the construction of a cement factory at Rochefort, a formula very close to that of M. Hendrickx:

$$x(SiO_2\,2.35CaO)+y(Al_2O_3\,3CaO)$$

It follows quite clearly therefore from the experiments made by M. Bied and M. Hendrickx in practice, and by different authors, that we can obtain hydraulic products corresponding to the artificial cements with the following formulas:

$$x(SiO_2\,2CaO)+y(Al_2O_3\,CaO)$$
$$x(SiO_2\,2CaO)+y(Al_2O_3\,2CaO)$$
$$x(SiO_2\,2CaO)+y(Al_2O_3\,3CaO)$$
$$x(SiO_2\,3CaO)+y(Al_2O_3\,2CaO)$$
$$x(SiO_2\,3CaO)+y(Al_2O_3\,3CaO)$$
$$x(SiO_2(2.3)CaO)+y(Al_2O_3\,3CaO)$$

This reviews all the formulas actually used in the manufacture of artificial portland cement by complete fusion or by incipient fusion. The theory of M. Le Châtelier remains intact in its fundamentals, and only the celebrated formula

$$SiO_2\,3CaO+Al_2O_3\,3CaO$$

is attacked. Now this formula was a simplified interpretation of the results at one period for the rudimentary means of manufacture at that period. It must be recognized, and M. Malphettes with us, that the conclusions of M. Le Châtelier on the subject of tricalcic silicate have left the door open to all formulas, even that of M. Hendrickx, from the moment that the number of molecules of lime in the silicate formed during the clinkering varies between two and three molecules. In his book "Constitution of Hydraulic Mortars," M. Le Châtelier himself advises to hold, for practical quantities, below the formula $SiO_2 3CaO$, which gives the maximum quantity of lime permissible, with the sole object, he says, of avoiding the presence of expansible products in the cement. This amounts, from the theoretical point of view, to admitting a lime content below three molecules. In his book "Cement and Hydraulic Limes," M. E. Candlot gives the percentage chemical composition of different artificial French, Belgian, American, English, and German cement (pp. 161 and 162). All these cements are products obtained by incipient fusion from the vertical or rotary kiln, the fused cement not existing at the time of that publication. The quantities of each of the substances of composition varying in the following limits, the average chemical composition of these cements would correspond to

	Amounts per cent	Average per cent
Silica	20.04 to 26.10	23.07
Alumina	4.86 to 10.60	7.73
Iron	2.10 to 5.30	3.70
Lime	57.42 to 67.30	62.36
Magnesia	.33 to 4.96	2.64
Sulphuric acid	.26 to 2.00	1.13

which corresponds, except for the magnesia, to the majority of the chemical compositions given in M. Candlot's table. If we divide the average percentages of the above table by the molecular weights of the corresponding substances, we shall obtain the following average molecular analysis:

Silica	3.84	SiO_2
Alumina	0.75	Al_2O_3
Iron	0.24	Fe_2O_3
Lime	11.30	CaO
Magnesia	0.66	MgO
Sulphuric acid	trace	

If we consider the iron as alumina and the magnesia as lime, the sum of the substances present will be:

$$3.84SiO_2+.99Al_2O_3+11.96CaO$$

If we accept, during the burning, the formation of tricalcic aluminate ($Al_2O_3 3CaO$) claimed by modern opinion on artificial portland cement composition, the $.99Al_2O_3$ will satisfy $.99\times3=2.97CaO$, and there will remain $11.96-2.97=8.99CaO$ available to combine with the silica. The coefficient of the silica being 3.84, that of the lime will be $\frac{8.99}{3.84}=2.35$, and the formula of the silicate thus obtained will be ($SiO_2 2.35CaO$). The cement thus obtained would therefore have the formula:

$$3.84(SiO_2 2.35CaO)+.99(Al_2O_3 3CaO).$$

(To be continued)

Investigation Reveals Scarcity of Fluorspar

RESULTS of an examination of the various Western fluorspar deposits made by R. B. Ladoo, mineral technologist of the Department of the Interior, are set forth as follows in Serial 2480, just issued by the Bureau of Mines:

With one exception, all of the deposits worked have been so small, or so far from transportation, or contain fluorspar so mixed with silica or barite or both, that profitable production of gravel grade of fluorspar, acceptable to Eastern steel mills under present standards, has been impossible, and the future seems no more promising.

With only one exception, the most accessible ore from the mines which have been worked has been removed. The mines are for the most part in poor physical condition, and future operations will be increasingly difficult and expensive.

Most of the Western mines have long and expensive hauls to railroads, and the ore bodies are too small to justify the cost of installing improved methods of transportation, or modern mining and milling equipment.

The production of acid fluorspar west of the Mississippi river from ore bodies now known probably will not exceed 100 tons annually.

It was estimated that the properties visited in the Western states can produce for a few years a maximum of 13,000 tons annually of a grade of gravel analyzing on an average 5 per cent or higher in barite, and a maximum of 4000 tons of fluxing lump. The Western steel mills, on account of the difficulty of obtaining fluorspar in gravel form, have been accustomed to use in their open-hearth furnaces both lump and gravel. The estimated consumption of the Western mills is 10,000 tons annually.

"Back to School" in the Roofing Slate Industry

W. H. Smith, Treasurer of the North Bangor Slate Co., Recognizes the Urgent Need for Apprentices and Takes Steps to Revive Practice

By Alan G. Sanger
Eastern Representative, Rock Products

A SCHOOL for apprentices in the roofing slate industry has been started by W. H. Smith, treasurer of the North Bangor Slate Co., Bangor, Pa. This step has been taken with and by the consent of the State Board of Labor and Industry. The idea is logical in its conception and will undoubtedly prove farreaching in its effects.

In order to properly understand why this school has been established, it will be well to briefly review the history of the slate industry:

In the eastern Pennsylvania slate section the industry is only about 80 years old. The possibilities of a commercial industry were recognized by a man who had at that time—1850—just come over from the slate sections in Wales. This man was R. M. Jones, in honor of whom the citizens of Bangor have placed a statue in front of the high school. He recognized the outcroppings, and prospected and established beyond doubt the presence of commercial slate. This man immediately sent word to his friends and relatives in the old country and soon after there was an influx of Englishmen and Welshmen into this section.

The workings were opened up in a crude way—merely shallow wells at first; then deeper pits with hand windlasses. Each improvement in machinery meant an increased efficiency in operating. Meanwhile, the slate was being treated on the surface by men who knew the game; blocking, splitting and trimming of roofing slate was an art and as with all crafts in those days, the art was handed down from father to son, but in a rather inefficient way.

At an early age, even as young as 8 or 10, boys were brought to the plant by their fathers and put to work. For months all they did was run errands and be generally useful; at the same time, they were supposed to keep out of the way. To do these two things, has always been a puzzle to any boy's mind.

After a long time, and to keep him out of mischief, the boy was given some tools, put in a corner and left to his own resources. Perhaps after quitting time, his dad would teach him a few tricks of the trade; at any rate, the road to Success was long and hard—the average time required was about eight years—yet after he had become a finished workman, his lot was not an unenviable one. He received fair wages and steady work.

About 15 years ago, a big change came over the industry. Boys were forbidden by law to work in the quarries until they had reached the age of 18, yet they were allowed to work part time in other industries like the silk mills or shirt factories. Fourteen was the minimum age, and even then he had to attend continuation school for one day a week until he was 16.

This law worked a hardship on the slate industry, for by the time the boys had the working age of 18 they had already established themselves in other trades and were unwilling to enter the roofing slate industry as apprentices. As a result, the roofing slate trade was fast becoming a lost art; the industry was being threatened if not with actual extinction, at least with a dominating attitude on the part of the skilled workmen still left in the trade.

Although this threatening situation has been recognized for years by all roofing slate producers, it took the courage of one man to start something and carry it through to a successful conclusion. The honor belongs to Mr. Smith. As he was hampered by the law, the first thing to do was to secure a modification of the Labor Board's ruling in regard to quarries. Only last January, Mr. Smith and Mr. Chapman, of

Panorama of Bangor, Pa.—the town which "patronizes home trade." The author of this article saw only one wooden-shingle house during his visit to Bangor

the Chapman Slate Co., Bethlehem, Pa., acting on instructions from the National Slate Association, drew up a petition to the State Board of Labor and Industry seeking a modification of its ruling, so that the roofing-slate producers could survive.

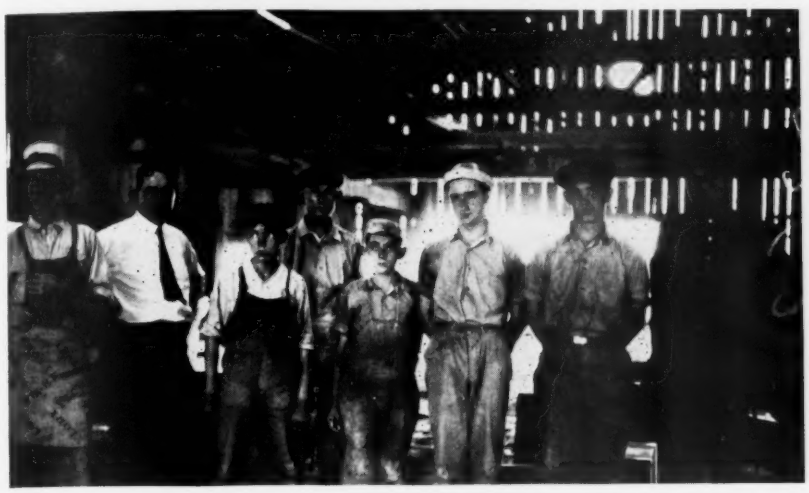
Mr. Hays, secretary of the association, and Mr. Smith went to Harrisburg and were given a fair hearing. Mr. Smith took some slate and tools and demonstrated how splitting was done. He exhibited photographs of other steps in the process to show that there was no danger either from tools or dust.

His petition was successful and on June 8 he received permission from the board to employ young men in fair competition with the other industries. This permission specified his company only and required that he conform to certain reasonable restrictions. These restrictions were only fair, and undoubtedly Mr. Smith would have instituted them anyway regardless of instructions from Harrisburg.

His schoolhouse consists of a large, well-lighted and well-ventilated building; windows are on all the sides and there are eight in the roof. This building is set apart from the other quarry and mill operations and the boys are not allowed to wander away. Mr. Smith has equipped the shed with overhead traveling cranes and chain blocks so that the boys do not have to lift any heavy pieces. Those who split and trim can do their work seated, the blockers only being required to stand. An inspector from the State Board has already visited the plant and put his approval on it.

Mr. Smith's class consists of six boys ranging in years from 14 to 18. They are under the constant supervision of a reliable and skilled workman—a man who is taking keen interest both in the boys and in the school. These boys are of American parentage of Dutch and English descent and make very apt pupils. It is planned to change off about every three weeks; in this way each boy learns a new phase of the roofing trade and his work does not become monotonous.

The boys are paid $1.50 a day and work on a 48-hour basis. Mr. Smith does not expect them to earn their pay—in fact, he is satisfied if they earn the pay of the instructor. Their work is good. Examination of the squares they produce show them equal to those produced by the skilled slater.



The class of the North Bangor Slate Co. The instructor stands at the left; Mr. Smith stands beside the instructor

The limiting factor is quantity, not quality.

The older workmen at the plant are interested but skeptical. They have voiced no objections as long as the idea is kept within reasonable bounds. The boys themselves are catching on to the idea with good spirit and are interested in their work. Not all will stay; some are planning to go on through high school and then into other lines of work.

Only a Fair Percentage of "Graduates" Asked

All Mr. Smith asks for is a fair percentage of "graduates"; he would be the last to advise against more education. He believes he is accomplishing some good for the boys and for the industry. For the boys, he provides them with summer work anyway and an opportunity to use tools, which is the average boy's delight and at the same time to learn a trade in six or eight months instead of that number of years, as in the old days. For the industry—he hopes to stir up in the coming generation interest in this local and basic industry and to stimulate the other roofing-slate producers into active co-operation.

The step he has taken is courageous and farseeing and Mr. Smith deserves not only individual success but also the active and wholehearted co-operation of every roofing-slate producer. Their very salvation makes it imperative.

Limestone Greatly Increases Yields of Cabbage

ONE ton of ground limestone to the acre annually with no other treatment has increased the yield of cabbage 13 tons per acre as an eight-year average at the Ohio Experiment Station at Wooster and at the Marietta test farm. Lime is also a specific control of clubroot of cabbage which gives additional reasons for applying it.

Spinach is another crop that will give a big return for the use of limestone on an acid soil. The difference between limed and unlimed spinach is so great as to lead one to think heavy manuring or fertilizing was the cause.

In contrast to these results the tomatoes have given only a one-fourth ton increase from limestone applications. These results show that the requirements of each kind of crop must be studied and treated according to their requirements rather than to treat all alike.

Liming Shows Good Results at Wisconsin Station

Liming showed decidedly improved yields in hay crops at the Spooner station, according to an article reporting results in Wisconsin Bulletin 352. In some of the plots the limed areas in 1922 showed increases of over 50 per cent over the unlimed, and on an average all of the limed areas produced over 30 per cent more hay per acre than the unlimed areas.

One of the striking things about these liming experiments was the fact that weeds early gained a foothold on the unlimed land. As the alfalfa becomes weakened through unfavorable conditions, it is driven out by the weeds which are competing with it. While no exact data are available, the best estimate placed the percentage of weeds in the unlimed alfalfa at about 15 per cent, which shows that lime in this case influenced the quality as well as the quantity of the crop.—*Bulletin No. 68, National Agricultural Limestone Association*

Southwestern Graphite Co. to Build Plant at Houston

THE Southwestern Graphite Co., which has a graphite plant at Burnett, Texas, is to build its main plant at Houston, according to the Galveston *News*. The building will be located at Lyons avenue and the Texas & New Orleans tracks.

A railroad is now being laid to the site of the plant. The initial unit will be 200x50 ft., and will be equipped with the most modern machinery. A 40,000 lb. grinder has just been received.

The initial capacity will be 15,000 lb. a day, according to C. A. Wheeler, local manager.

The Southwestern Graphite Co. is one of the interests of Albert C. Burrage. The home office is at Boston and some graphite grinding is done there, but the principal plant will be maintained at Houston.

Give the Animals More Calcium*

Lack of Minerals Limits Their Growth and Production—Relation of Lime to the Origin of Breeds of Livestock in Continental Europe

By Elmer O. Fippin
The Fippin Agricultural Consulting Service, Washington, D. C.

MINERALS are likely to be the focus of attention in animal feeding in the next few years, as the ration balanced between protein and carbohydrates—the nitrogenous and the non-nitrogenous foods—has been the focus during the last 30 years. While we speak of animals here, the human animal should also be kept in mind for the same principles apply to his ration as to the lower animals and a large number of interesting observations could be presented. "Making bricks without straw" is a hard task, if not quite impossible, as the children of Israel testified of old, and it is equally difficult to make meat and milk and eggs without the materials that constitute those products. The mineral elements—calcium, phosphorus, sulphur, potassium, sodium chlorine, and others used in less amounts—are quite as necessary as the starch and sugar and fat and digestible fiber and the protein materials.

This subject is of concern to many producers of rock products for theirs are the materials from which these minerals come directly. Aside from their general concern they will be interested in putting their materials in suitable form for use in animal nutrition. Some months ago ROCK PRODUCTS carried an article on the relation of lime dust to the control of tuberculosis, which has a bearing on lime in animal nutrition.

Not All the Minerals in Bones

While the bones and teeth are dominantly mineral and contain 30 to 50 per cent of those constituents, this is by no means all or even the largest part of the minerals that are required. There is about 1 per cent of minerals in the soft parts of the body and a certain amount is required daily to carry on the functions of the body, after which use the elements are eliminated, just as nitrogen is eliminated as urea after it has performed its functions in the muscular or other cell. In total, from 4 to 6 per cent of the animal body is made up of minerals.

Further, man has pushed his domestic animals to abnormal production, not only of meat, but also of milk and eggs and wool. Especially the second and third of these are rich in minerals, for they are designed to nurture the young life and build up its skeleton. In milk there is about 0.75 per cent of total minerals, of which about 0.12 per cent is calcium and 0.09 per cent phosphorus.

Lack of Minerals Limits Growth and Production

Just as a lack of protein and carbohydrates—starch, sugar, digestible fiber and fat—are known to stunt growth and production as well as reproduction, so the lack of minerals are now seen to do the same things. Investigation by Dr. Meigs, of the United States Department of Agriculture, shows that the production of milk is being limited for many cows by the lack of sufficient calcium or phosphorus or both, by as much as 37 per cent. Not only is production limited, but the deficiency of certain minerals either directly causes or induces many serious disorders as recognized by the veterinarian.

The whole matter is largely a matter of keeping track of the "bank balances" in these constituents, especially in forms the animal can assimilate, just as we have been supposed to keep track of the protein balance. In the past it has been assumed that if the animal received enough protein and carbohydrates it would, of course, be getting enough of all the minerals, in spite of the fact that we have fed salt to the cattle and oyster shell to the chickens for generations, and these are nothing more than mineral supplements.

Suppose we extend such observations. The idea that hens must have meat scrap in order to make large egg production is now thrown very much in question by investigations at the Ohio Agricultural Experiment Station, which shows that when vegetable proteins, in the form of soybean and peanut meal, are supplemented with minerals, the egg production is as large as when meat meal is fed.

Corn and the cereals in general are deficient not only in nitrogen but also in minerals for the largest production of animals. At the Iowa station the addition of mineral supplement to a good mixed ration supplemented by rape pasture increased the daily gain of hogs by 13 per cent. Similar results have been secured at the Ohio and the Indiana stations; at the latter the cost of the gains were reduced by 20 to 50 cents per hundred by the use of a mineral supplement. The extent of such gain will, of course, depend on the extent of the mineral deficiency.

The Calf and the Lime Supply

The idea was conceived at the University of Wisconsin that cattle could not be properly maintained on a cereal diet. A group of cows was selected and put on three different rations for a year at a time. One diet was made up of oats grain and oats straw and was very deficient in calcium. The calves of mothers fed on this diet during the gestation period were in general born prematurely—most of them dead—and they had an average weight much below the calves of mothers fed on either of the other two rations and the mothers cleaned with difficulty. When a lime mineral supplement was added to this same ration the calves were born at the proper time, they averaged some 8 lb. heavier in weight and they were all alive and able to be up promptly. The third ration, including corn stover and alfalfa or clover hay to provide the necessary amount of lime in the forage, produced calves that were still heavier, alive and frisky. From that investigation it was concluded that a good sized dry breeding cow having all other nutritive requirements satisfied, should receive at least 0.33 per cent of calcium in her ration. On the basis of 25 lb. of dry matter per day, this would amount to nearly 0.1 lb. and a total of 35 lb. per year for body maintenance alone. If she is in milk she must have assimilable calcium proportionate to her milk flow.

Requirements for Milk Production

Ten thousand pounds of milk per year per cow is not an impractically high yield, yet it is more than twice the average production in the United States. In this amount of milk there are 12 lb. of calcium which added to the undigested calcium in the food, makes the total annual requirement of a cow producing 10,000 lb. of milk and a calf amount to upward of 100 lb. of calcium.

I have calculated the amount of calcium in 40 lb. per day for a year of two balanced rations published in reliable textbooks dealing with animal feeding. One of these contain about 75 lb. of calcium and the other only 32 lb. per year, or shortages of about 20 and 60 lb. respectively. In view of these facts it is not surprising that the

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milk flow is limited on the average to much less than the 10,000-lb. standard mentioned.

At the Ohio station, Forbes secured results indicating that the cow draws on the calcium in her skeleton until the latter part of the gestation period or until the milk flow is down to about 10 lb. per day. This would argue for a dry period. It certainly suggests that the matter of whether a cow should be dry for a period, is connected with the supply of minerals she receives.

Relation of Lime to the Origin of Breeds of Livestock

The vital relation of minerals, and especially calcium, to the animal functions, suggests that the natural supply of calcium in the forage and drink in the regions of the world where breeds of livestock have arisen must have been good, and conversely, that livestock had not been successfully developed in regions of naturally low lime supply. I mention drink as a source of minerals because one important distinction in natural waters is their degree of hardness, and the chief element of hardness is lime compounds, especially the carbonate of calcium. Such water may contain 300 or more parts per million of hardness, representing 1 lb. of calcium in 5000 to 8000 of water.

When it is considered that a cow will drink 40,000 to 60,000 lb. of water in a year and much more on high milk flow, it is evident that she may get 8 to 12 or more pounds of calcium in the water alone or as much as there is in 100,000 of milk. Moreover, in most regions of hard water, the soil and therefore the forage, especially the legumes and roots that are grown in larger proportion in such regions, are richer in lime. I have extended my general observations on this possible relation between natural lime supply and the regions where livestock have developed, and this is what I find.

Continental Europe

The pre-eminent livestock region of France, from which we get the Percheron horse, the French coach horse and the basic stock that has entered into several of our breeds of cattle, and where breeds of sheep and swine have been developed, is that section north and northeast of Paris—Flanders, the Somme valley and the lower reaches of the Seine river. The geological structure of this region is made up of at least 75 per cent of limestone and chalk formations that give very hard water and soil rich in lime. The Belgian horse rests back on this same background. The same calcareous formations swing around northeast into Germany, and here—between the mouths of the Rhine and the Ems rivers and along the boundary of the Netherlands—is the region where the Holstein and the Dutch Belted breeds of dairy cattle have been developed over a period of hundreds of years. From this same region comes the German coach horse.

The British Isles

Crossing the English Channel to the British Isles we have a broad belt of chalk and limestone swinging north from Southampton nearly to Newcastle, and dominating the whole eastern half of England. There are scattered bands to the west. A little further north, in the southern quarter of Scotland, is another broad band of limestone that trends southwest and seems to coincide with a similar broad band of calcareous formation in central Ireland. Next, remember that this entire area has been glaciated—that is, great masses of Continental ice have moved down from the northward over it, picking up and grinding into the soil and carrying along to adjacent rock areas immense quantities of the lime rock. This means a large increase in the amount and distribution of lime in the soil and the prevalence of hard water.

What do we get in the way of breeds of livestock from this region? Beginning at Southampton we get the Sussex and probably also the Devon cattle, the Southdown, Shropshire, Oxford, Hampshire, Suffolk, Dorset, Cotswold, Leicester and Lincoln sheep, and the Berkshire, Hampshire and Yorkshire hogs. From the northeast of England in this belt come the Shorthorn—Teeswater cattle from the Tees valley—and the Shire, the Suffolk Punch, the Cleveland Boy and the Hackney horses a little to the southward. Over the line in Scotland we get the Clydesdale horses from the Clyde valley, and over a ridge to the west, in the Ayr valley, is the home of the Ayrshire cattle.

Now we change to a different sort of geological condition. Regions like our Piedmont, in America, have their soils formed from the granitic type of rocks—igneous or metamorphic rocks made up of plutonic minerals, many of which carry lime.

Most of these areas will grow pretty good crops of clover, although the soils are not so rich in lime as many of the distinctly limestone soils. From such a region comes the Herford cattle of the west of England, the Aberdeen Angus cattle of the northeast of Scotland, the Galloway cattle of the southwest, and the West Highland cattle from the western part of the same country. The Jersey and Guernsey Island have the same type of formation dominant, and they are synonymous with well-known breeds of dairy cattle.

The Arab Horse

Turning to horses we should note, first, the Arab horse, which seems to have been the foundation stock of all our modern American breeds—speed, coach and draft—through introductions into France and England. His home is the Arabian country and the north of Africa. Two facts stand out: First, limestone formations are known to form considerable areas in the former region. Second, all of this region has an arid to a semi-arid climate, and this has a distinct influence on the content of minerals in the soil and in the potable waters. It greatly increases them. The Arab horse has always been noted for the fine quality and great strength of his bones. This observation checks into a demonstrated fact developed by E. B. Forbes at the Ohio Agricultural Station, namely, the swine fed lime-rich supplements to their regular diet in the form of carbonate of lime or bone flour produced bones of the greatest density and as much as 50 per cent greater strength.

Breeds Developed in America

Crossing to America it may be said that all our notable livestock regions are in the lime-rich class—which does not mean that the soils will not respond in larger crops to applications of lime. The Poland China hogs arose in the lime-rich region of southwestern Ohio. The Duroc-Jerseys were developed at Kerby Homestead, in Saratoga county, New York, which is cut by a limestone formation. The Chester White breed was developed in the granitic type of country of Chester county, in southeastern Pennsylvania, and in close association with rich limestone valleys.

The American trotters, lineal descendants of the Arab horse in recent generations, may be said, literally, to get their speed out of lime-rich soil. Space will not permit a statement of the details of this correlation. Suffice it to point out that Hambletonion Ten, the "father of trotters," and Green Mountain Maid, the "mother of trotters," were both reared and lived and have monuments to their performance in a glaciated limestone valley in Orange county, New York. Electioneer, the original of the Clays, Justin Morgan, Ethan Allen, and many other notable animals trace to lime-rich regions.

Further, I have looked up the place of rearing and performance of the 10 highest milk-producing cows of the five leading dairy breeds, and I believe it can be shown beyond serious question that their performance rests on a lime-rich region as an essential factor.

I do not wish to be understood as saying that the whole record is traceable to lime, for I am not unmindful of breeding and the other factors in feeding and good handling. What I want to point out is that the direct neglect of the mineral factor has resulted in the natural lime supply exercising an unconscious control over the development and performance of the animal.

Relation of Breeding and Physical Disorders

In the West some sections are popularly known as good calf country and others only as good steer country. Dr. W. H. Lytle, of the State Livestock Sanitary Board of Oregon, states that he has examined many of these regions and finds the good calf sections are high mineral sections. Person-

ally, I have yet to find a notable or even a moderately successful stock region on marine deposited soils of the lean, shale, slate and sandstone type that normally produce low-lime soils and notably soft water, such as most of our Coastal Plain.

Moreover, the calf question suggests contagious abortion, the scourge of many cattle men. It is found that a lack of lime seems to induce the disorder and a good supply of lime seems to curb it. In browsing over the field I have made a list of some 10 disorders that are either directly induced by or seem to be promoted by a lack of calcium. These are, in addition to abortion, acidosis, rickets, loin weakness, milk fever, tuberculosis, tetany, defective teeth, and scurvy. Iodine seems to control the hairless pig disorder.

Mineral Supplements

As I have said, calcium and phosphorus seem to be the two most critical elements, and sulphur is worthy of attention. This is not based on the total requirements but on the probability of deficiency.

I am aware of the views of those who believe that the assimilation of lime is controlled by some kind of a vitamine or by some principle in fresh green crops. Without entering into a discussion with those persons I have these two points in mind: First, the animal can not assimilate the minerals it does not get, and there is certainly good evidence that the animal often does not get enough minerals for minimum requirements under the most favorable conditions. Second, there seems to me to be good evidence that animals can assimilate some strictly mineral forms of lime. It might be interesting to make a study of the factors controlling the solubility of lime compounds under the conditions that prevail in the digestive tract. I agree that it is highly desirable to use foods naturally rich in the essential minerals, such as the legumes. It remains that we have a large body of otherwise valuable food materials, such as soybean and peanut meal, and if we can make them more valuable by the use of mineral supplements, it is so much gain to the feeder and to the country.

Some mineral supplements are very complicated. For ordinary practical purposes they may be relatively simple. It may be made up of bone flour to supply phosphorus, flowers of sulphur to supply sulphur, and a very fine carbonate or hydrate of high calcium lime to supply calcium. A mixture made up of 5 parts of the lime compound, 4 parts of the bone flour, and 1 part of sulphur with 10 parts of salt and the whole added to the ration at the rate of 1 to 100 to 150 may be expected to give good results in the great majority of cases. Various laxatives are sometimes added and a few grains of potassium iodide where hairless pigs occur.

Form of Lime in Use

The question of the best form of phosphorus and calcium is interesting. Air-slaked lime is frequently recommended, and likewise wood ashes. The first is usually assumed to be a carbonate of lime when, as a matter of fact, in practice it is about four-fifths hydrated lime and the remainder carbonate and oxide. Rock phosphate does not seem to give as good results as bone meal or bone flour. Wood ashes are a mixture of minerals with 30 to 50 per cent of lime, 2 to 6 per cent of potash, and 1 to 2 per cent of phosphorus, with other materials. For humans, calcium lactate is frequently prescribed.

I am led to believe, though it is not as yet a clearly demonstrated fact, that a considerable part of the calcium supplied to the animal should be in the carbonate or hydrate form rather than in combination with any stronger acid, such as sulphuric or phosphoric acids. My reasons are these: The bones of an animal on a generous lime diet will contain up to 20 or 25 per cent of calcium carbonate. The ordinary ash analyses do not reveal that fact. Magnesium will not take the place of calcium and seems to perform a very minor role and large amounts weaken the bones.

Further, one function of calcium in the animal, as in the soil, is to neutralize acids. Now, the only forms of calcium that can do this are those with an acid so weak and inoffensive that it easily gives way to any other acid compound without complicating results. The only one that fulfills that requirement is carbonic acid, the very weak fizz-gas of the soda fountain, that we like, to give sparkle and zest to our drink. But to be available it must be finely divided.

On the other hand, hydrated lime has no acid combination; it is a chemical product of extreme fineness and much higher availability, quite as practicable as the carbonate and it is the chief constituent in air-slaked lime, so frequently recommended. An excess of phosphorus over the calcium induces rickets. Up to the point where the phosphorus and the sulphur are needed by the animal, the calcium may not be used in those combinations, and the remainder of the calcium should be in the more simple form. Mineral supplements may be very simple and complicated mixtures with high-sounding names should be avoided.

The facts indicate that the more general use of the type of mineral supplements here recommended will greatly improve the ration of farm animals. More attention to balancing up the ration in minerals through the larger use of leguminous and root crop forage will do the same, but has practical limitations. Again, let it be remembered, it is exceedingly hard to "make bricks without straw," and this many of our farm animals have been trying to do.

DO YOU GET WHAT YOU PAY FOR?

William R. Basset, President
Miller, Franklin, Basset & Co., Inc.

WHEN you buy materials, you specify carefully the quality you require, and you pay the bill only after an inspection has shown that you received what you bought, both as to quantity and quality.

But when you buy labor do you pay for the right quantity and quality, or do you buy a pig in a poke? If you pay a workman only for being present in your plant between the hours of 8 and 5, you are buying something "sight unseen," and probably with the usual results.

Payment for production, in some form, has been applied somewhere to practically every job that a man can be called on to do. It may be piecework, premium and bonus, or any one of a dozen plans.

Even where unions have ruled rigidly against any form of payment except day work, I have seen men willingly increase their production for the sake of extra earnings. There is just one attribute that you can bank on every worker possessing—he wants more money, and most of them will work to get it.

Payment for production applies not only to those workers commonly classed as productive. I have seen methods worked out for janitors, truckers, stockmen, millwrights and others of the so-called non-productive kind.

But there is a right and a wrong way to use wage incentives. A poorly designed wage incentive may hold back instead of stimulate production. And it is important to "sell" the men on the plan. If the method is correct and if it is explained to the men clearly, they will 9 times in 10 give it a fair try. It pays to have the method worked out and the standards set by men of experience and skill. An amateur or a bungler can cause tremendous trouble.

It is not at all uncommon for production to be doubled by a good incentive. I have seen costs reduced 75 per cent while the workers' earnings were increased 30 per cent.

Correction

IN the article, "Vibrating Screens for Sand Plant," in ROCK PRODUCTS for July 14, page 20, it was stated: "The cost for concrete sand is $1.03 per day or 10 cents per ton." The cost statement shows that the screening cost per ton of concrete sand was ($.0010) 1/10 of 1 cent per ton.

Lime-Kiln Thermal Efficiency*

By Victor J. Azbe
Consulting Combustion Engineer, St. Louis, Mo.

Possibilities for Improvement in Combustion and Heat Absorption Efficiency in the Lime Industry Are Tremendous. Nearly One-Half of the Fuel Burned Is Wasted

MANY YEARS have been spent by the one who presents this paper in the study of combustion as applying to industrial concerns. It was only about a year and a half ago that attention and study were given to combustion as applied to lime burning, with the result that there is no question of doubt but what attention to this subject by the member companies of this organization will result, not only in saving in the fuel cost but increasing the efficiency of their plants as well as improving their products.

There are few industries where so much fuel can be saved as in the lime industry. On the other hand, there are few industries where it is so difficult to make this saving. The difficulty is mostly due to the fact that convenient methods of measuring kiln performance are not generally known; consequently, in very many cases the fuel efficiency check of any accuracy is not obtained until at the end of the year. Even when a kiln test was run and all lime and coal weighed, the test had to be of so long a duration to mean anything that all kinds of bad or possibly good conditions were found to have crept in and so the final results could not possibly have portrayed the best possible conditions.

As a result therefore many lime plants waste a tremendous amount of fuel. The fuel efficiency of many a kiln is only 20 to 25 per cent, when an efficiency of 50 per cent and more is possible with proper attention. A certain large lime plant was operated for an entire year at an average efficiency of only 24 per cent. It saved some $25,000 a year by changing the firing methods, while if it would approach the 50 per cent kiln efficiency mark, the saving as compared with the 24 per cent efficiency operating methods would be around $40,000 a year in fuel only.

Some lime-kiln operators think they know when a kiln is right by appearances, and while it is true that an expert kiln operator can tell a great deal, his senses are not delicate enough to be able to judge combustion and heat absorption efficiency of a kiln except only very roughly. The more the writer has to do with lime kilns, the less inclined he is to guess and the more he depends upon proper instruments as an aid.

*Paper read at the annual convention of the National Lime Association, in New York City, June 13, 14 and 15, 1923.

Right Method for Getting Combustion Efficiency

When a kiln test is being run, it necessarily must be run for at least one week, during which time so many conditions may creep in that the final results tell only very little as to how the kiln should be operated for best results. To overcome this, the writer developed a method which is interesting and should prove of value to engineers and chemists in lime manufacturing plants.

When coal burns under a boiler the carbon combines with the oxygen of the air to form carbon dioxide. The same happens in a lime kiln, only here carbon dioxide is also being driven from the limestone by the heat from the fuel so that there are two streams of carbon dioxide, one from the coal and one from the rock. In boiler practice the carbon dioxide percentage in the waste flue gas is being determined in all modern plants because it indicates the amount of air used for combustion and is quite an important check on waste. Many boiler plants have automatic CO_2 recorders that take samples every few minutes, analyze it, and record the results on a chart.

How to Find the Percentage of Escaping Carbon Dioxide

To know the carbon dioxide percentage that is escaping with the waste gas from the lime kiln is even more important. Due to the definite relation between the two mixed streams of carbon dioxide, much more valuable information will be obtained than in the case in boiler practice.

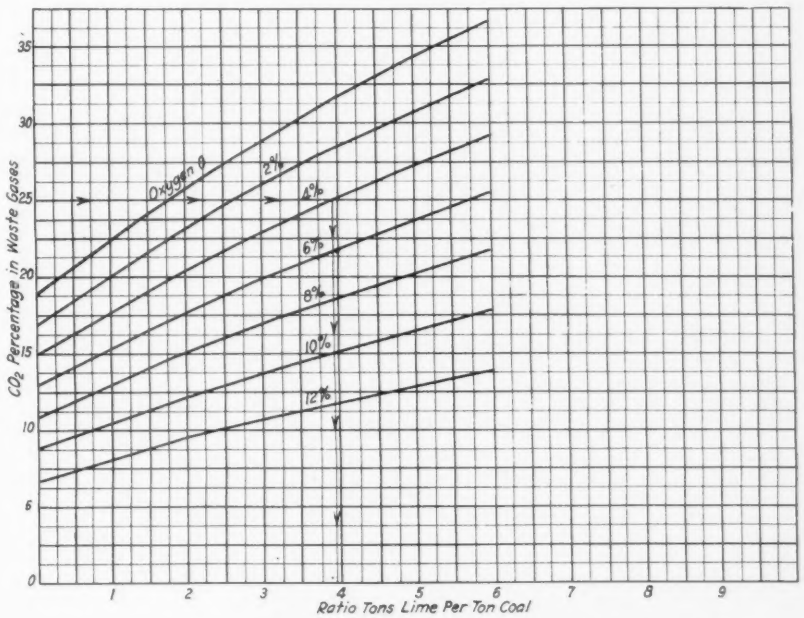


Fig. 1—Tons of lime made per ton of coal burned as gaged by carbon dioxide and oxygen content of gases escaping from lime kiln for high-calcium limestone

With bituminous coal of the better grade when burned under a boiler, the maximum possible percentage of carbon dioxide to be obtained would be about 19 per cent. This is without the use of excess air; ordinarily, even under the best conditions, there will be at least 4 per cent oxygen in the flue gas which is being brought in by the excess air used in burning the fuel which reduces the CO_2 percentage to 15 per cent.

Assuming now that we are burning this fuel under a lime kiln, we would get only 15 per cent CO_2 and 4 per cent oxygen, the same

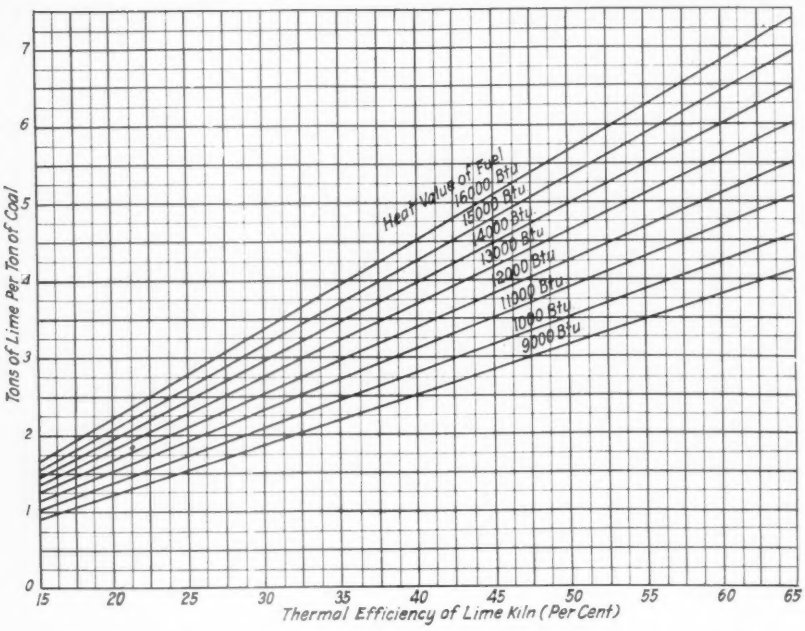


Fig. 2—Thermal efficiency of lime kiln—lime-fuel and heat value is known

as we did when burning under the boiler. If this would occur it would be quite evident that carbon dioxide is coming only from the coal; none could be coming from the rock and no lime would be made, and consequently the ratio of lime to coal would be 0:1. If the CO_2 percentage would be, say, 20 per cent, and oxygen still about 4, then we would realize immediately that to obtain such a large amount of CO_2 gas from coal, when so much excess air represented by oxygen is used, is utterly impossible, and so the additional carbon dioxide must be coming from the limestone.

Fig. 1 was calculated on this principle. It will be noted that at 20 per cent CO_2 and 4 per cent oxygen, the ratio of lime to coal is about 2:1. If the chart is further studied, it will be noted that for the same oxygen percentage the ratio of lime to coal increases as the CO_2 percentage increases, and when the CO_2 decreases, less lime is made per ton of coal. Consequently, the more carbon dioxide gas there is in the waste gas from the kiln, the better it is. As noted, the carbon dioxide is modified by the oxygen. Since oxygen represents excess air and, naturally, the more the excess air entering the kiln through holes in the fire on the grate or through the doors or brick work, the greater will be the volume of gas escaping and the more will the carbon dioxide be diluted.

Necessity for Analyzing Apparatus

To use the chart it is necessary to have some kind of Orsat gas analyzing apparatus. Then a sample should be drawn from the top of the kiln and the main gas stream, taking great care that a true sample is obtained. The sample should be analyzed for carbon dioxide oxygen and carbon monoxide. After the first sample, several more should be taken, preferably every 10 min. for 2 hr. Then results should be averaged, and by referring to Fig. 1 the ratio of lime to coal can be obtained for that particular kiln and for that particular period. Following are several gas analyses representing poor and good conditions:

Poor Conditions

CO_2	20	23	21.5	16.8	9.2	21.8
O	4.2	3.5	4.5	8.0	12	3.2
Ratio	2-1	2.7-1	3-1	3.2-1	2-1	2.3-1

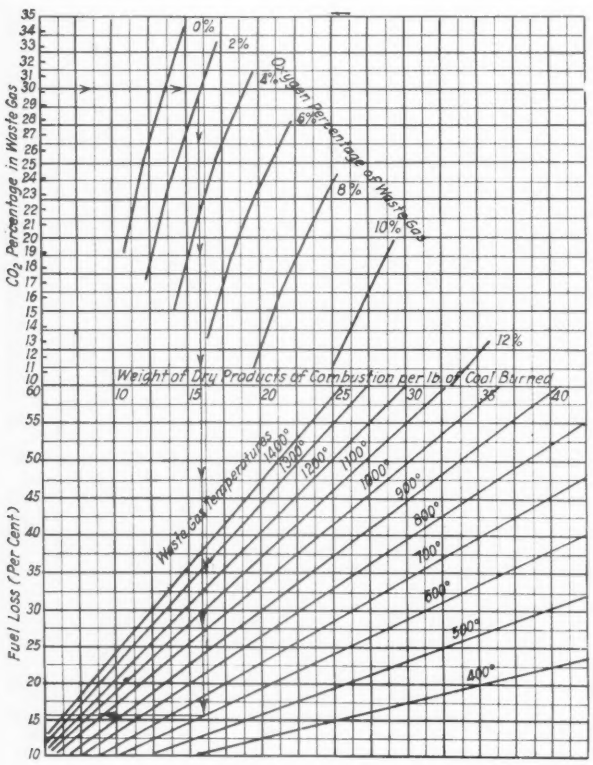


Fig. 3—Fuel loss due to escape of dry products of combustion from lime kiln

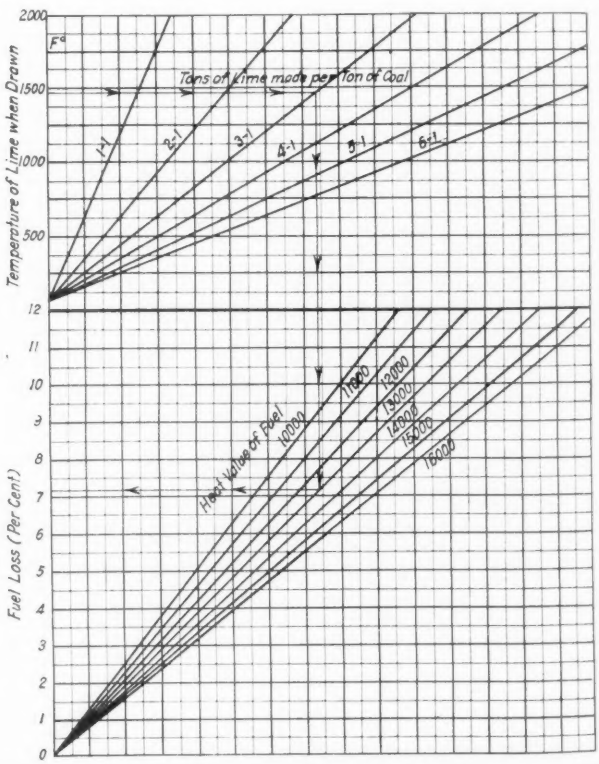


Fig. 6—Loss due to withdrawal of hot lime

Good Conditions						
CO_2	30	28.6	31.4	29.5	28.6	29
O	1.8	1.2	1.6	2.5	2.3	2.6
Ratio	4.5-1	3.5-1	4.8-1	5-1	4.3-1	4.9-1

It will be noted that CO_2 itself, while important, requires to be supplemented by oxygen analysis. It may be also well to emphasize carefulness. If the analysis looks unreasonable, change the position of the sampling pipe since it is extremely important that a proper true average sample be obtained. At times, all-of-a-sudden results will be obtained which will look far from right. Quite often this happens, but all that may have occurred is that the fireman checked his fire, shut off the air to the grates and the carbon dioxide percentage, instead of dropping down, shot away up—all due to the fact that accumulated heat in the limestone continued to drive CO_2 from rock.

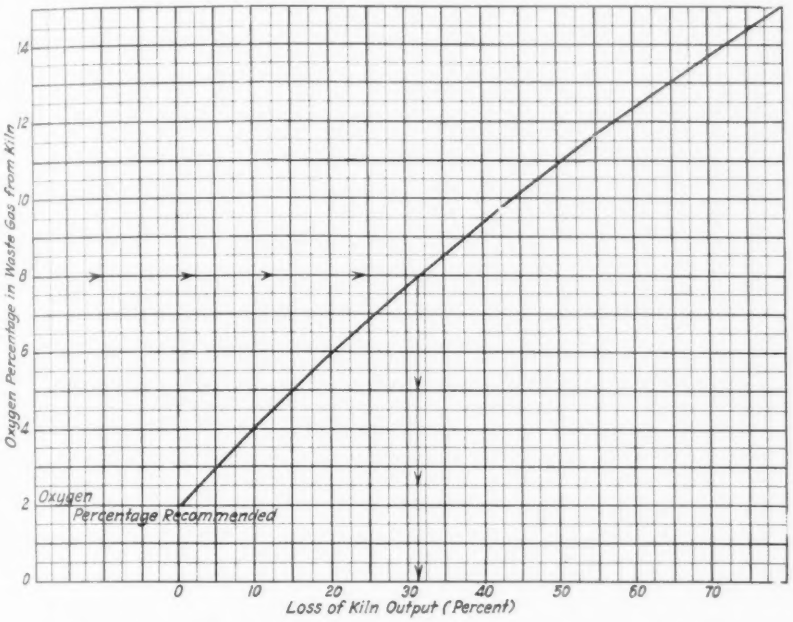


Fig. 4—Loss of lime output due to the use of too great a quantity of excess air for burning of fuel in lime kilns

After the lime-coal ratio is determined, if the heat value of the fuel burned is also known, the thermal efficiency of the kiln may be obtained by referring to Fig. 2. For example, assuming that the ratio is 4 to 1 and the heat value of the fuel 13,000 b.t.u. per pound, then by drawing lines through the respective points as shown, the thermal efficiency of 43.25 per cent is obtained. This figure means that 43.25 per cent of all heat in coal was actually used to drive carbon dioxide from limestone while the balance of 56.75 per cent was used or wasted in one or another of many different ways.

Determining the Important Heat Losses

If the carbon dioxide, oxygen, carbon monoxide content percentage and temperature of the waste products of combustion escaping from the kiln top are known, the most important heat losses can be determined. Under most conditions the greatest loss is that due to escape of gases at a relatively high temperature. In many cases temperature well over 1000 deg. Fahr. exists, while kilns are operated with normal temperatures well below 500 deg. Fahr. This loss is usually called *"the loss due to escape of dry products of combustion,"* and while it varies directly with the temperature, it is also dependent to a great extent upon the excess air used to burn the fuel, the other in leaking air either through kiln walls, poke-holes or draw-holes. Fig. 3 enables one to determine this loss. It will be noted that under good conditions represented by CO_2 30 per cent, oxygen 2 per cent, and escaping gas temperature of 600 deg., the loss would be 15.5 per cent. If, on the other hand, CO_2 would be 19 per cent, oxygen 8 per cent and temperature 900 deg. Fahr., the loss would be 37 per cent.

Harm Done by Inleakage of Excess Air

This chart emphasizes the harm done by the inleakage of too large amounts of excess air as represented by the oxygen percentage. Many kilns are operated with 10 per cent of oxygen, which represents about twice the amount of air actually necessary. This unnecessarily large volume of air passing through the kiln does damage in three ways:

1. It necessarily escapes hot from the kiln and consequently wastes heat.
2. It overloads the kiln gas-carrying capacity uselessly and consequently reduces the kiln capacity.
3. It reduces the temperature in the kiln and the heat transfer between the hot flame and the lime is reduced and the kiln capacity lowered.

The second condition is illustrated by Fig. 4. It will be noted that the greater the oxygen percentage the lower the kiln capacity. The principle assumed in drawing this chart is that if the air which uselessly passes through the kiln would be employed to burn fuel, more fuel would be burned and more lime made.

As to the third condition, it may be said that it is possible to use so much excess air

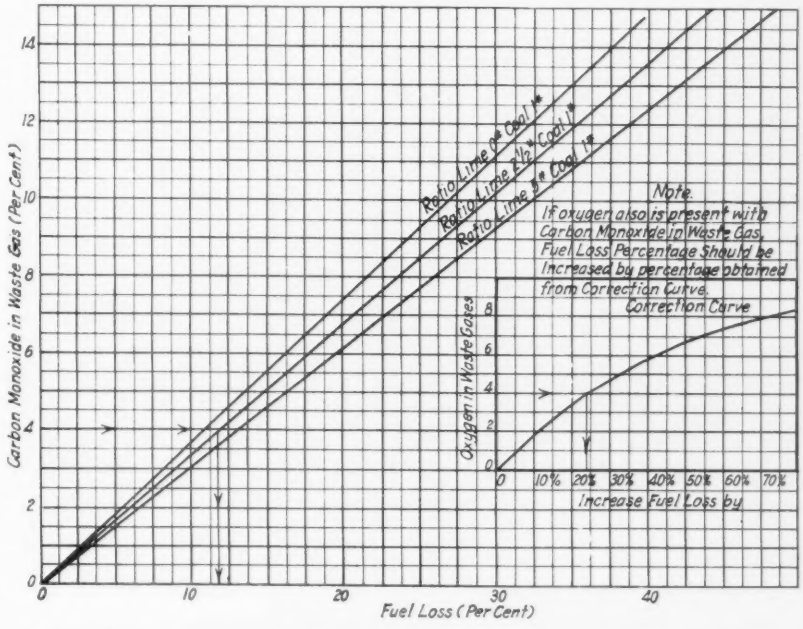


Fig. 5—Loss due to incomplete combustion (carbon monoxide loss). Oxygen content of waste gas, zero

that the dilution would be so great that the temperature would be below the temperature required to decompose limestone; therefore, no lime would be made no matter how much fuel would be burned.

Some excess air, however, is necessary, otherwise incomplete combustion—a second most important loss of heat from lime kilns—will result. This loss in some cases is so great that the gas burns to a height of 10 ft. or more above the kiln shaft, and at night illuminates the surroundings. Of course, only gross carelessness will permit such a condition, but even in plants where this does not occur the loss due to incomplete combustion at times is from 30 to 40 per cent.

The presence of carbon monoxide, a combustible gas resulting from gasification of carbon, in the waste gases leaving the kiln, indicates a loss due to incomplete combustion. In a certain lime plant the following results of gas analysis were obtained:

Time	Carbon Dioxide	Oxygen Per cent	Carbon Monoxide Per cent	Smoke
10:25	29.4	0	12	Heavy
10:42	28.4	1	1.2	Slight
10:47	24.0	0	0	None
11:00	24.2	4.5	0	None
11:15	32.0	0	12	Heavy
11:30	28.7	0	2.4	Light

Fig. 5 illustrates the seriousness of having as high as 12 per cent carbon monoxide in the waste gas; when this occurred the loss of fuel was about 37 per cent, all of which was preventable. Even when the carbon monoxide percentage is only 4 per cent, the loss still is 11 per cent. The loss calculated from the presence of carbon monoxide percentage, however, is not the entire loss due to incomplete combustion. When carbon monoxide is present, it may well be assumed that hydrogen, methane and other rich combustible gases are also escaping and wasting heat.

If there is a proper mixture of combustible gases and air, the vertical lime kiln should not waste any heat whatsoever due to incomplete combustion, because conditions are ideal. The gas burns in a hot zone where there is no possibility of chilling. As it percolates through the limestone the mixture of combustible gases and air is bound to be complete also. The writer has many times obtained gas samples from lime kilns when the oxygen content was zero and there was no carbon monoxide present. The fuel was completely burned with only a theoretically required amount of air.

In practice, to assure complete combustion it is necessary to use some excess air. About 2 per cent of oxygen in the waste gas should indicate a sufficient amount of air, provided this air passes with the gas through the hot zone. This amount, however, will be insufficient if the firing is irregular. In the case of the plant where the tabulated results were obtained, the trouble was due to the fact that more coal was gasified in the producer than could be burned by the air that the kiln could draw by natural draft. A further reason for the bad conditions was the very infrequent firing. The producer was charged at 10:25 and again at 11:15; consequently, the gas that it supplied to the kiln varied greatly in volume, and since the air supply was constant, there was just barely enough air at times for complete combustion, and at other times a great deficiency.

Regular and frequent firing are extremely important in case of lime kilns. When there is heavy smoke, there is great waste due to incomplete combustion. When there is no smoke, there is likely to be a great waste also, due to the too large volumes of excess air.

Other Heat Losses Encountered

There are other heat losses encountered in kiln operation, but they cannot be controlled as readily as the loss due to too little air or the one due to too much air, or too high temperature of escaping gases. These losses are:

1. Radiation, which can be controlled only by varying the kiln design.
2. Loss due to moisture in air, which is very small.
3. Loss due to moisture in rock; also very small.
4. Loss due to escape of moisture resulting from combustion of hydrogen in fuel. This loss can be reduced slightly if the temperature of the escaping gases is reduced, and, also, if the efficiency is generally improved, so that less coal is burned for a given amount of lime made.
5. Loss due to withdrawing of hot lime. The magnitude of this loss can be determined from Fig. 6. This loss can be reduced somewhat when the operator is very careful.
6. Loss due to carbon in ash. This loss depends upon ash percentage in coal and care used in cleaning fires.

It is the writer's opinion that possibilities for improvement in combustion and heat absorption efficiency in the lime industry are tremendous and were barely touched. While there have been exceedingly good papers written and delivered before this organization, the number of investigations made on lime kilns is small as compared with the investigations made on boilers. As a result, it is nothing unusual to find a boiler 70 and even 80 per cent efficient, while the majority of lime kilns are operated only around 30 per cent efficient. Of course, to equal up-to-date boiler performance with lime kilns would require special kiln construction; nevertheless, the difference, even in the case of ordinary kilns, should not be great.

The lime kiln is at a disadvantage due to greater wall area for the amount of fuel burned, consequently the radiation loss will be more than that for a boiler. Also, lime withdrawn is usually at a red heat. But radiation can be controlled by insulation, and to offset the heat lost by the hot lime the lime kiln has the advantage by the counter current heat flow in the upper zones of the kiln and by the much more thorough mixtures of air and combustible gas in the burning zone. One may say that a good kiln and a good boiler, both properly operated, should give equal results; also a poor kiln and a poor boiler should give equal results. Why this is not the case is due to two reasons:

1. In the lime industry little or no attention is paid to proper proportioning of air and fuel.
2. Heat transfer in many cases is poor due to an ununiform size of rock charge or to improperly charged rock.

I think I am safe in stating that nearly half of the fuel burned by lime manufacturers is wasted. This waste should be prevented.

Northern Gravel Co. Gets Publicity

SEVERAL times ROCK PRODUCTS has called attention to the possibility of helping the public to appreciate gravel-pit and quarry operations as regular industries by a little local newspaper publicity. An excellent example has just come to hand in the West Bend (Wis.) *News* of July 4 containing a first-page article on "Exploiting Fine Gravel Deposits." Herewith is the editor's introduction:

"The immense gravel deposits of this vicinity have of late years called into existence a number of industries, but if one should wish to see the place of their most extensive exploitation, he is directed to the gravel pit of the Northern Gravel Co. about a mile west of Barton. The company last year abandoned its pit east of Barton and leased the new pit from the Northwestern road. It contains 40 acres and has a spur track from the main line running into it. It has been fitted up this spring with machinery, structures and equipment to increase its capacity three or four times that of the old Barton gravel refinery.

"It is worth while and quite interesting to go through the plant, which the writer had a chance to do the other day, accompanied by the general manager, W. L. Loveland, who kindly explained things."

Studying Pennsylvania's Deposits of Molding Sands

THE American Foundrymen's Association has long felt the need for a method of standardizing molding sands and, in co-operation with the engineering division of the National Research Council, has developed and perfected scientific methods of testing molding sands.

Pennsylvania is a large producer of molding sand and the Topographic and Geologic Survey of that state, realizing the desirability of having the sands tested, is collecting samples from the widely scattered deposits throughout the state. The field work is under the direction of R. W. Stone, assistant state geologist, and the tests will be made in the laboratory of Prof. H. Ries, at Cornell University, Ithaca, N. Y.

Cost Finding and Its Problems in the Sand, Gravel and Quarry Industries

By Alfred Baruch
Consulting Industrial Engineer, New York City

IV.—Order Symbols in Sand and Gravel Costs Help to Distinguish Between the Productive and the Non-Productive Costs

THE introduction of the method of treating all activities of the plant as if they were individual jobs covered by an order, compels us to adopt some system of symbols with which to identify each order. This system has to distinguish between the productive and the non-productive costs.

There are several methods which may be employed. One is the simple lettering of every order as *A, B, C, D,* etc. The difficulty with this method is that within a short time so many letters are required to identify the orders that it is easier to write all the details out.

The second method is by the use of *pneumonic* symbols. These are name symbols. For example, the identification for gasoline, for trucks or tractors, would be "g. t." The mark for stock insurance would be "s. i." Personal property taxes would be identified as "p. p. t." On the productive orders this method would cause confusion as it would be difficult to distinguish one week's work from the next without the repetition of letters.

A third method which may be used is the Dewey decimal system. By this method all productive and non-productive work is classified and charges made for each class. For example, all salaries would be charged to "01." The salary of the president would be charged to "011"; the salary of the secretary to "012"; the salary of the bookkeeper to "013," etc. This is an excellent method. It is by far the simplest because it may be expanded indefinitely without becoming too complicated. In order to be practical for the quarryman, it has to be modified somewhat.

All expenditures made by the plant would have to be charged either to productive orders or expense orders. To distinguish

PRODUCTION ORDER

Description ..... Date ..... Order No. .....

Department ..... Foreman .....

OPERATIONS	MATERIAL			LABOR			BURDEN			UNIT COST
	Standard Price	Quantity	Total	Hours	Rate	Total	Hours	Rate	Total	
TOTAL										
									TOTAL LABOR	
									TOTAL MATERIAL	
									TOTAL OPRTG. COST	
									ADM. & SELLING EXP.	
									TOTAL COST	

The production order automatically fixes the procedure for putting the plant on a monthly cost basis. It tells the operator where he stands once a month instead of the usual annual report

MONTHLY COMPARISON OF SHOP COSTS

ITEMS	CURRENT MONTH	AVERAGE MONTH	INCREASE	DECREASE
CURRENT EXPENSES				
Wages - Foreman				
Wages - Indirect Labor				
Indirect Material				
Repairs				
Heat				
Light and Power				
Gasoline				
Supplies				
Miscellaneous				
FIXED EXPENSES				
Rent				
Insurance				
Taxes				
Depreciation				
Interest on Shop Investment				
TOTAL SHOP BURDEN				
DIRECT LABOR COST (PAYROLL)				
MATERIAL PURCHASED THIS MONTH (PURCHASE BOOK)				
PLUS INVENTORY AT FIRST OF MONTH (STOCK RECORD)				
TOTAL				
LESS INVENTORY AT END OF MONTH (STOCK RECORD)				
NET SHOP COST FOR MONTH				
OFFICE EXPENSES				
Executive Salaries				
Clerical Salaries				
Office Supplies				
Travelling Expense				
Advertising				
Commissions				
Association Dues				
Printing and Stationery				
Telephone and Telegraph				
Charities				
Miscellaneous				
TOTAL OFFICE EXPENSE				
TOTAL SHOP BURDEN				
PREDETERMINED RATE % X DIRECT LABOR COST				
OVER OR UNDER ABSORBED BURDEN				
TOTAL OFFICE EXPENSE				
PREDETERMINED RATE % X SHOP COST				
OVER OR UNDER ABSORBED OFFICE EXPENSE				
RECONCILIATION OF SHOP COSTS				
NET SHOP COST FOR MONTH				
OFFICE EXPENSE				
TOTAL COST FOR MONTH				
TOTAL SALES FOR MONTH (SALES BOOK)				
LESS COST				
MANUFACTURING PROFIT FOR THE MONTH				

between these charges, all productive order numbers are simply numerical and all expense order numbers are prefixed by the letter.

The expense order code is arranged by classes, such as salary, office expenses, repairs, supplies, etc. The productive order code is arranged by product, where there is more than one kind being turned out, or by time, where the production is uniform throughout. The cost cycle under the system to be outlined in these articles will be a monthly period. Where the time symbol is used, all work done in January will be identified by the number of that month and a consecutive number of the order as "011, 012, 013," etc. Those orders completed in December will be numbered 121, 122, 123, etc.

The Expense Order Code

All indirect expenses are divided into two general groups, the office expenses and the plant burden. The purpose of this separation is twofold: First, it makes possible a readier detection of waste and unnecessary expense; second, it permits a more scientific application of the burden. Later on, in this discussion, the burden will be grouped according to production centers, but for the sake of illustration of the order symbol method of identification, all expenses are lumped below. The list of order numbers given is by no means inflexible. It may be expanded or contracted according to the size of the plant. But is should be understood that the more detailed the classification of expenses, the easier it will be to obtain accurate cost. It involves hardly any more work.

Office Expense Orders

EO11—Executive salary. Charge this account with all salaries for the president and other executive officers.
EO12—Clerical salary. Charge this account with all salaries for the bookkeeper, stenographer and other clerks employed.
EO13—Office supplies. Charge this account with the cost of postage and office supplies.
EO14—Traveling expenses. Charge this account with the money spent for transportation and other necessary expenses incurred while securing orders.
EO15—Advertising. Charge this account with the payment for advertising in magazines, periodicals, etc.
EO16—Commission. Charge this account for all payment of commission to salesmen.
EO17—Association dues. Charge this account for membership fees in trade associations, business clubs, etc.
EO18—Printing and stationery. Charge this account for all printing and stationery except that used by the plant as distinguished from the office.
EO19—Telephone and telegraph. Charge this account with all telephone and telegraph bills.
EO110—Charity.
EO111—Miscellaneous expense. Charge this account with all office expenses not taken care of in any other way.

Expense Burden Order Code

EO21—Salary of superintendent. Charge this account with the cost of supervision of all departments.
EO22—Foreman. Charge this account with the cost of the salary of the departmental foreman.
EO23—Salaries of clerks. Charge this account with the salaries of timekeepers, stock keepers and other clerks, if any.
EO24—General labor. Charge this account with the wages of all general labor or indirect workers.
EO25—Repair to buildings. Charge this account with all labor and materials used in repairing any part of the buildings.
EO26—Repair to machinery. Charge this account with all labor and materials used in repairing any part of the machinery.
EO27—Repair to tools and other equipment. Charge this account with all labor and materials used in repairing or replacing tools or other equipment.
EO28—Maintenance and transmission. Charge this account with all labor and materials used for repairing or replacing any part of the transmission line or the power house.
EO29—Printing and stationery. Charge this account with the cost of printing time cards, material records, order records and all documents used by the plant.
EO30—Engines. Charge this account with the cost of maintaining the engine.
EO31—Electric current. Charge this account with all payments for electric current, both for light and power.
EO32—Coal. Charge this account with all payments for coal.
EO33—Tracks. Charge this account with the cost of maintaining the tracks.
EO34—Stable expenses. Charge this account with the cost of maintaining the stable and horses.
EO35—Maintenance of truck. Charge this account with all repairs and replacements to truck.
EO36—Gasoline. Charge this account with the cost of gasoline.
EO37—Drivers. Charge this account with the salary of drivers.
EO38—Depreciation. Charge this account with the monthly depreciation charges for all machinery and equipment.
EO39—Depletion. Charge this account with the monthly depletion charge for the sand bank. (The manner in which this charge is arrived at will be explained later on.)
EO40—Interest on plant investment. Charge this account with the interest on machinery and equipment. (This subject will be treated in detail later on.)
EO41—Stock insurance. Charge this account with all the insurance against fire, theft or anything else except liability and compensation which must be charged directly to labor.
EO42—Miscellaneous expense. Charge this account with all expenses not already provided for.

The production orders are identified by the month. This method has several distinct advantages. It establishes a basis for easy comparison of costs by season. It automatically fixes the procedure for putting the plant on a monthly cost basis, which tells the operator where he stands once a month, instead of the usual annual report.

So far, we have dealt only with the externals of the cost system. We have determined the elements of costs and broken them up into groups. We have classified the records of the property owned and the charges against these records. The operating costs were divided into direct and indirect expenses. Indirect expenses were carefully analyzed and an order code of charge accounts set up for them. But we have not yet indicated the medium through which the information of these various expenditures reach the records. This is done through forms of one kind or another. It is recognized that these forms should be designed with the special need of the quarryman in mind.

What the Forms Should Cover

A sand bank is really a very simple matter to operate. The complications come from the volume of work necessary to perform the various operations successfully. Consequently, the forms designed must bear these factors in mind. They should cover the following points:

1. *They must be extremely simple.* The average worker has a strong personal dislike for forms. He thinks they belong to that vague, indefinite sphere known as "red tape." Consequently, if he is called on to make a lot of entries, he will either refuse to fill the reports out altogether, or, if he cannot do this, he will make out these reports in such a half-hearted manner that whatever value they might have is nullified.
2. *They must be planned so that the correct information will get back to the records.* A report that invites errors is a waste of time and money.
3. *They must furnish a comprehensive report of the work done.* Progress can be measured only by means of forms that will enable the operator to compare the actual work done with the schedule of production.
4. *They must distribute the expenses so that the cost of each lot going through is clearly shown.*
5. *They must be few in number.*
6. *They must be designed with possible future expansion in mind.*

The task of providing necessary forms is difficult because the majority of plants are so small that more than one clerk is not warranted, and it is therefore necessary to introduce as few forms as possible to induce the operators to use them. The task is precarious because the small plant owner dislikes using forms and in some cases is sure to neglect them. When that happens, the forms will be taken to symbolize the whole system and it will be said that the plan has failed or that it is not practical.

Let us now consider the character of the documents referred to above. They fall into three general classes:

1. Instructions to do the work.
2. Records of material and other expenses incurred.
3. Reports of work done.

Instructions to do the work may take the form of the production order mentioned. This order must be written, for a verbal order is very undesirable. The secret of the successful management of employes is to be able to fix the responsibility for errors promptly but justly. A verbal order invites "buck-passing" whenever anything goes wrong. More important still is the fact that

this production order in a quarry marks off the lot produced into units that permit an accurate distribution of costs.

The production order is a definite instruction to the foreman. It can be a simple outline of what is wanted. All that it has to contain is the order number, the quantity of material required, and the time allowed to do it. This method fixes the responsibility very definitely. Where only one product is quarried, the order is used for cost purposes only, and to establish a record of the efficiency of the plant as a whole. The record of the quantity of sand excavated is an important part of the cost record. It may be made subject of a special report or it may be arrived at from the labor records.

Without a Work Report the Cost System Is Worthless

The report of work done is the most important form of all and without it the cost system is worthless. It is the time report of labor and, as will be seen later on, it forms the foundation of the entire cost keeping structure. The amount of detail that appears on the reports depends entirely on the size of the plant and the extent of supervision possible. At least, it is necessary to know the name of the worker, the date, the order number to which his time may be charged, and the quantity of work completed during any given time. The fact that the cost of each lot or each order is to be calculated separately makes it necessary that a new card should be filled out for every order the man works on.

All the documents that are essential to the collection of costs have been discussed in a general way. These are the time cards and expense charge slips. How these reports are carried to the cost records will be treated next. It will be remembered that every order was given a number. All work and all expenditures necessitated by this lot are connected with it through the order number. The quantity of sand produced can be determined from the shovel operator's report.

(To be continued)

Will Southern Indiana Operators Quit Business?

Attempts to Better Competitive Conditions and Eliminate Price-Cutting Have Conflicted with State Anti-Trust Laws

FOLLOWING the decision of the judge of the Hendricks Circuit court at Danville, Ind., to the effect that the Bedford Stone Club Auxiliary and the International Cut Stone Contractors' and Quarry Men's Association are combination in restraint of trade, Walter W. Drayer, secretary of the international organization, declared that indications pointed to removal of the companies from the state. The organizations were given six months under court order to close up their business. According to Mr. Drayer, the individual companies will have much difficulty in operating under the court order's provisions and he predicts the removal of both finances and fabricating plants from the stone districts in the southern part of the state.

He said this action would not be a retaliatory measure against any one because of the ruling, but merely a measure of protection on the part of the companies, who would be forced out of business if they remained in Indiana. In his statement Mr. Drayer said:

The bringing of this action was based upon a number of ridiculous allegations, namely: That the defendants maintained a monopoly in the limestone industry; that they conspired to fix prices; that they incited strikes for the purpose of limiting production; that they created a slush fund to reimburse members who had taken work from non-members at a loss (and, mind you, we were charged in the state's bill of complaint with fixing prices); that they divided territory and that they refrained from bidding on Indianapolis work against local firms.

Not one of these slanderous allegations were proven—in fact, no evidence was introduced in the hearing in support of them. It seems apparent that but a cursory investigation was made prior to the bringing of this complaint, otherwise the state would have deterred prejudicing public opinion against one of Indiana's greatest industries by any such ridiculous allegations.

The stone trade in the past has been the victim of a deplorable and pernicious practice of price cutting. In the evolution of the building industry whereby the general contractor, rather than the architect or owner, became the agency through whom sub-contractors had to obtain their work, a damnable system of misrepresentation and bargaining with an owner's property was set up by too many unscrupulous general contractors.

A Practice That Makes Material Man "the Goat"

General contractors of this class, after obtaining bids on various branches of the work to be sublet, and using such bids as a basis for making up their own general estimate on which they obtained the work, set out to shop these various branches of the work. They never thought of giving the stone work to the stone contractor whose legitimate competitive bid they used to obtain the work. Rather did they set out to get subsequent bids, and in doing so they not only communicated the low competitive bid, but oftentimes misrepresented it, agreeing to give the work to the contractor who would cut 5 to 10 per cent off the fictitious figure they represented to be the lowest bid.

This brought no saving to the owner. He paid for the stone work the figure obtained by the general contractor in the original competitive bidding. The general contractor pocketed what he was able to save by peddling and shopping the work as additional profits. The owner, due to the fact that the cut stone contractor who did take the work did so at a figure below cost, got a job in keeping with such figure. In other words, the quantities were curtailed, while the grade of material and workmanship were slighted.

Due to pernicious practice, thousands upon thousands of dollars have been sunk in quarry property and equipment in Indiana that will remain there until Judgment Day, while the investors went broke.

Now the stone trade, in order to stabilize the business, to eliminate these leeches from the building industry, and to give to the owner a faultless job in keeping with the architects' plans and specifications at a minimum cost, set up a principle whereby it would bid in open and legitimate competition, the individual firms exercising their right to decline to submit subsequent figures upon a job on which competitive figures had been previously taken and the general contract awarded.

Only the Application of the Principle of Self-Preservation

Surely a commendable principle; one that stabilized and placed the industry upon a straightforward business plane and one that assured the owner of a job in keeping with his architect's plans and specifications at a minimum cost. The method by which we sought to accomplish this principle the court has held to be in violation of a state anti-trust law.

It would seem that what our government, federal and state, requires today is a definition of trusts; what is and what is not a trust. Anti-trust legislation was set up a number of years ago to prevent gigantic combination of capital from monopolizing business, and rightfully so. The courts now place a very wide construction upon these anti-trust laws which, unless modified, is going to have a demoralizing effect upon American industry. To class as a trust a vast number of individual competitive interests that endeavor through an association to place industry upon a high ethical plane of responsibility and integrity for the benefit of the public and the industry is both ridiculous and destructive.

If the state's attitude is to be upheld—and we understand it to be the attorney-general's position that all associations of competing interests are inimical to the law of Indiana—then Indiana will indeed drive many of her prominent industries out of the state. As for the stone trade, Nature has of course located the quarries in Indiana, but as the capital that has made this great industry possible has come from other states, that capital and the plants that make possible the industry that gives employment to thousands of people at maximum wages, will undoubtedly be forced to locate in other states.

WE WROTE a friend recently that it was reported he was "building a $500,000 plant." And he promptly Mark-Twained us that the report was "largely exaggerated." He was building a new plant, he added, but "If I had $500,000 I'd be inclined to forget that plant pronto!" Still, we will continue verifying all our press reports if only in the hope that some day we will find a Croesus who'll admit he has that vast sum.

The Human Element in Quarrying

By R. N. Van Winkle
General Manager of the Hawkeye Quarries Co., Cedar Rapids, Iowa

The Successful Quarry Must Have an Organization of Intelligent, Clean-Cut, Contented Employes, and at Least Partially Solve the Problem of the Human Equation

IN the present-day period of high industrial development we have ready-reference tables for solving quite satisfactorily practically every industrial problem except that problem of the human equation, and while stupendous strides have been made to eliminate as much as possible the human element or human equation from industrial life, it can be likened to the poor in our great social formation, for, it is said, "The poor are with us always."

Back centuries ago when crushed stone was produced by the physical giants of that age pounding together two pieces of rock until they cracked of sheer brute strength, the human element was possibly little considered for these men were driven by taskmasters in some manner or other. But this, we must remember, is 1923 A. D. and driving men is not only no longer in vogue but very unpopular and altogether unprofitable.

In present-day quarrying the operator who treats his men fairly and squarely and gives consideration to their human side — who takes into account the human element—is a real operator. Usually, where one finds a moneymaking, successful quarry operation, he will also find an organization of intelligent, clean cut, contented employes, which is ample and convincing proof that the human element has been given consideration and that the human equation has at least been partially solved.

Remember the adage that "Nothing succeeds like success," and if you are a successful operator you are probably blessed with an abundance of applications from efficient, experienced men who are always ready and anxious to become identified with a successful operator and a successful organization. Every man, whether a common laborer or an executive, has pride, a personal human pride in some one of its many forms.

Morale at the Quarry

It was out of the late World War that we learned the meaning of an old word which makes especial appeal to the writer when speaking of men and organization, and this word is *morale*. Morale means mental conditions as regards, courage, zeal and confidence. It is the morale of soldiers in the opposing armies that wins or loses battles, and it is the morale of the men in your organization that makes for your quarry or crushed stone business a financial success or a hopeless failure.

Those of us in the quarry business realize that there are no soft or easy jobs around a going, successful quarry; that it is a heman's work and no place for the cake-eater or brilliantine sheik. Quarry work for the rank and file of employes is not only monotonous, but extremely hard, and for just these reasons an employe is likely to lose interest and suffer a relapse in morale at any time. Imagine yourself, if you can, operating a jack-hammer drill constantly for 10 hr. a day, six days a week, or firing a steam shovel day in and day out. Your morale would unquestionably begin to slump and your interest in general, and in your work especially, if you had no outside agency to arouse it, would become extremely lax. You cannot turn a man into a machine with even a small degree of success, so it is one of the jobs of the quarry operator and executive to arouse and encourage his men to take an interest in their work and to keep them tuned to the proper pitch. Encourage every man to think for himself and put a premium on individual initiative. Of course your men will make mistakes and you may expect this, for the man who never makes a mistake—it's a safe bet—is the man who never does anything worth while.

Methods of Arousing Interest

There are numerous methods of arousing interest and maintaining morale in a quarrying operation such as bonus systems, piecework, and cash prices. A capital idea is to interest your men in tonnage produced each day, number of railroad cars or trucks loaded with finished product together with, say, quarry cars hoisted or dumped into the crusher. Make this information common talk around your operations and, if convenient, have a blackboard or bulletin board where the results of a day's operations are posted. In a way they are scores for the day's work, and as contents of any description whatsoever have a peculiar appeal to the American people you will find this plan will awaken an interest and a desire for competition to improve the daily records of production.

Another plan which has been practiced by the writer with very satisfactory results is to give to each mechanic a steel toolbox 18 in. long by 6 in. high and 6 in. wide, equipped with a tray and padlock. These boxes cost $2 each and are given to the man to be kept as their own property, provided they buy for their own use a small assortment of hand tools. The practice is to let the mechanic select his own tools from the catalog. These tools are then purchased by the company at wholesale, giving the man advantage of the wholesale price. From our own experience we find that the average man buys from $10 to $15 worth of tools, consisting in most cases of the following:

A 12-in. and a 6-in. steel-handled monkey wrench; an 8-in. and an 18-in. steel-handled pipe wrench; a 1½-lb. ball pein hammer; three end wrenches; a 2-ft. folding rule; a diamond point chisel; two hand chisels; a cape chisel and a round-nosed chisel.

Every operator can readily see the advantage gained from having each mechanic equipped with the necessary hand tools for repair work, and moreover, they are his own tools and therefore he is always ready and equipped for an emergency. As you well know, tools bought by the company for use about the job by everyone are in reality no one's tools and are therefore greatly abused and often lost through sheer carelessness. The above plan greatly reduces the tool account, puts the tools in the hands of the men who use them and creates an interest and pride among the men not only in their own tools, but in company tools of bigger sizes and special shapes which must always be available for immediate use in case of breakdown.

Knowing Your Men

It is a wonderful thing and intensely interesting to get out among your men, get to really know them, interest them and encourage them. When things are breaking badly and everything apparently seems to be going wrong, is not the logical time to upbraid men. That's the time to pat them on the back and encourage them, and right in this connection the writer is reminded of an experience he had in Ohio a few years ago.

A foreman, an exceptionally high-class and loyal employe, began to slip and little by little he became disgruntled with his surroundings, his fellow workmen and the equipment. In fact, to his way of thinking, nothing was right, the world, and especially

our operations, were all wrong. This man's morale was low, his interest was dead—yes, he could have been discharged and doubtless deserved it, but on second thought he was a faithful, experienced employe and an asset to our organization, if we could but find a means to revive his morale.

After considerable deliberation, he was called into a conference and intrusted with the job of visiting another operation of a similar nature in another state on the pretext of obtaining some information which was made to appear very important to us. After a couple of days away from his regular job, with a complete change of surroundings and scenery, he returned. After making his report he volunteered the information that he would not work at the plant he visited for any amount of money — in fact, it was "a no-good proposition." Our equipment and organization and methods of working were far superior to theirs, and if anyone thought they had something to crow about they should see our operations. It worked out to the queen's taste and we had reclaimed by a simple, inexpensive method a very valuable man to our organization.

Clean, Comfortable Surroundings

Where a quarry is located away from a town or city and where one is compelled to house and feed his men, nothing will return a greater benefit and reduce labor turnover more than good clean, comfortable living quarters and substantial, wholesome, well-prepared food. Steel army cots and army blankets are especially adapted to quarry boarding-house service and are cheap and easily obtainable. Don't make your bunk house or boarding camp a dumping ground for abandoned, broken-down furniture, old beds and bed clothes, but give your men clean, well-kept beds and bed clothing and see that they are kept clean.

In our operation we furnish the boarding-house and all equipment, including stove, dishes, coal and lights—in fact, everything but the food. Give these to a competent boarding-house man or woman or man and wife free of charge, provided they feed your men well, under your supervision at a stipulated price per meal. You cannot work an underfed man, but you can work a man if you feed him properly. Keep your ear to the ground for any complaints about the food your men are receiving and see to it that any fault is remedied.

Using the "Safety" Signs

The writer is a believer in signs, neat metal or attractive wooden signs, pertaining to safety. In our quarry boarding-house we have neat metal signs which read: "This place is no better than you make it. Show by your actions that you appreciate what is being done in your behalf." Instill into your men the question of safety first and prove to them your belief in it yourself by having your quarry office equipped with an approved safety-first cabinet fully stocked, and encourage them to come to the office for first aid treatment.

Bear in mind that rates on workmen's compensation insurance are based on experience and that every accident which can be avoided in the quarry industry assists in reducing the compensation insurance rate. This of course works the reverse, for increased accidents mean increased rates. Show your employes your interest in their welfare by talking and practicing safety first and you will find they will be interested and respond readily.

As a rule the best man you can have is the man you have made in your own quarry; the man who knows your methods and is familiar with your operations. Therefore, offer your conscientious employe promotion as fast as you need men and as fast as he can accept and fill the position. Give your men something to look forward to; help them obtain an education in your particular business; select your men for such things carefully, and become yourself a student of human nature. Use a little psychology; you will find it interesting, wonderfuly so, and profitable.

The writer believes that the average employe, with proper character and morale is resentful of charity, and in our operations we attempt to make a small charge for such things as safety spectacles, rubber coats, etc., for outside work, as we feel this charge, irrespective of how trivial it may be, puts the ownership and care of the article into the hands of the man and awakens in him a sense of responsibility and interest which ultimately is of great mutual benefit.

New Cement Plant for San Francisco Bay?

THE Pacific Portland Cement Co. is said to have purchased all the stock of the Morgan Oyster Co., and through the latter company to have acquired a 90-acre tract of harbor-front property within the city limits of Redwood City on San Francisco bay for the purpose of building a new cement plant.

A news dispatch from San Mateo states:

"Confirmation of the rumor that there will soon be established on lower San Francisco bay one of the largest portland cement plants on the coast was seen in the recording recently in the office of County Recorder T. C. Rice of two deeds by which the title to approximately 91 acres of submerged and harbor land passes from the Redwood City Harbor Co. to the Morgan Oyster Co.

"The property included the 90-acre tract adjacent to Redwood creek and Westpoint slough, with the exception of rights of way for roads which were previously deeded by the Harbor company.

"The first deed, dated October 28, 1920, shows the transfer of the property to Oscar Ellinghouse of Alameda. This document carries $87 in stamps, indicating the purchase price to be $87,000. The second deed runs from Ellinghouse to the Morgan Oyster Co., and the stamps attached amount to $77.50, indicating that the Oyster company is paying $77,500.

"At the hearing before Col. Herbert Deakyne on the application of Frank Elbridge Webb for permission to construct a bridge across the bay, it developed that the opposition offered by the Morgan Oyster Co. was due to the fact that a cement plant was to be established on the lower bay. It has been stated that the Pacific Portland Cement Co. is now the owner of the entire stock of the Morgan Oyster Co., and that the company has completed plans for the new plant. However, this has never been confirmed by the cement company interests.

"Clauses in the deeds filed recently provide that the land may be used for manufacturing plant, including a portland cement plant."

Reopening of Cement Transit Case Asked by Road

REOPENING of the Marquette Cement Co. case to allow for sacking and storage in transit is asked by the Rock Island Lines in a petition filed before the Interstate Commerce Commission. The point affected is Davenport, where the Marquette company recently completed a new warehouse at a cost of $150,000.

Originally the company had expected a freight rate from its mill at LaSalle, Ill., giving it a tariff to points in Iowa with the privilege of sacking and storing in Davenport. Some 40 cement companies, among them the Western States Portland Cement Co., protested to the Interstate Commerce Commission and that body decided in favor of the plaintiffs.

Now the Chicago, Rock Island & Pacific Ry. has asked for a reopening of the case. The railroad is the one serving the new warehouse of the Marquette company. It holds that it can load out cars of cement from Davenport during the slack period of winter when grain box cars are west bound and can distribute from Davenport with economy in September and October.

Since the bringing of the original case the Western States interests here have been purchased by the Atlas Portland Cement Co., so that either way the case may be decided it is of much interest to Davenport commerce, says a local news dispatch.

A report of the original decision occurs in Rock Products, May 19, 1923, page 35.

Present Organization of the National Lime Association

Extensive Plan for Research Work Will Be Pushed

THE National Lime Association at its annual convention in June adopted a plan of organization which assures the continuation of its growing program of technical and research work and establishes a stability to the national organization which will make possible to establish and follow through to conclusion problems of research for the general benefit of the industry.

The national officers and board of directors remain as the controlling body, directing the entire research and trade promotional program of the industry, but for the purpose of assuring a continued source of income for all departments of the association and adding more flexibility to the local field promotional work, the program has been divided into two separate departments: first, the national program of technical research, publicity and national promotion; second, local trade promotional work by men in the field, subdivided and directed from two division offices, with headquarters located at Washington and Chicago.

The members of the association have agreed on a basis of dues for a period of two years, which will afford the national program of technical research work a larger working budget than has been heretofore available, and the members in both the Eastern division and the Central division have agreed on a basis of additional dues which allows for a considerable increase in local field promotional work in the two divisions.

The Lime Association loses the able leadership of Charles Warner, who has served as its president for the last four years, and who has been primarily responsible for bringing the work of the national association to its present high standard.

The new president, George B. Wood, is president and general manager of the Rockland and Rockport Lime Corp., of Rockland, Maine. He is a technically trained engineer, having received his degree from the Massachusetts Institute of Technology, has been an active director of the national association, and has added much to the lime industry in the way of technical advancement. He is a most enthusiastic believer in the future growth of the lime industry as the result of technical research and development, and is happily chosen as a successor to Mr. Warner.

William R. Phillips, the former general manager of the Lime Association, has resigned to take the position of vice-president and general manager of the American Lime and Stone Co., Bellefonte, Penn. The headquarters office and organization is now working under the management of Burton A. Ford, acting secretary, who carries along the work well qualified by his experience during the last year as Mr. Phillips' assistant at the Washington office. Mr. Ford is a technically trained man, receiving his degree from the University of Maryland. Prior to joining the association staff he was a division manager of the Virginia-Carolina Chemical Co., and secretary-treasurer of the Bryant Fertilizer Co.

Dr. M. E. Holmes has resigned from the technical staff of the association and Dr. G. J. Fink has been appointed chemical director. Dr. Fink is a graduate of Wabash College and was for six years instructor in chemistry at Cornell University, where he received his Ph.D. degree in 1914. He was also professor of chemistry at Iowa State College, and for five years prior to coming to the Lime Association was research chemist for the Hooker Electrochemical Co. Dr. Fink has been with the association staff for two years, and is well qualified to assume the direction of the chemical and research problems.

In addition to work at the association laboratory in Washington, the Lime Association is supporting at the present time fellowships in five leading technical institutions, where various special problems of investigation and research work are being carried through to conclusion. Co-operative relations also exist with other institutions where important research on lime problems is being conducted. The increased budget for this class of work will make possible, under the two-year program, the completion of the many problems on hand and the inclusion of new important problems.

The personnel of the National Lime Association is as follows:

President, George B. Wood, Rockland, Maine; vice-president, Fred Witmer, Woodville, Ohio; treasurer, Milton McDermott, Knoxville, Tenn.

Board of Directors: A. N. Griffing, Danbury, Conn.; C. J. Curtin, New York, N. Y.; George LeGore, LeGore, Md.; O. J. Vanderpool, New York, N. Y.; Warner Moore, Richmond, Va.; J. J. Urschell, Toledo, Ohio; F. M. Pinnegar, Cleveland, Ohio; Morgan Curtis, Petoskey, Mich.; B. L. McNulty, Chicago, Ill.; C. W. S. Cobb, St. Louis, Mo.; R. C. Brown, Oshkosh, Wis.; J. M. Gager, Chattanooga, Tenn.; J. F. Pollock, Kansas City, Mo.; H. Dittlinger, New Braunfels, Tex.

Headquarters staff: Burton A. Ford, acting secretary; R. C. Towles, office manager; Dr. G. J. Fink, chemical director; W. A. Freret, consulting engineer; J. A. Slipher, soil technologist; R. P. Brown, construction engineer.

Eastern Division, division office, Washington, D. C.: Henry M. Camp, division manager; R. C. Parker, agronomist; W. F. Campbell, construction engineer; W. F. Beyer, construction engineer; W. D. Steward, construction engineer.

Central Division, division office, Chicago, Ill.: G. B. Arthur, division manager; L. B. Burt, chemical engineer; A. B. Giett, construction engineer; W. H. Magee, construction engineer; C. O. Dowdell, construction engineer; A. C. Hamilton, Jr., construction engineer; L. E. Johnson, construction engineer; O. A. Wakeman, construction engineer.

Another Nashville Cement Plant Projected

THE Southland Portland Cement Co., a million-dollar concern which filed its charter in the office of County Court Clerk Tom Hill July 26, 1923, will have headquarters in Nashville, Tenn., according to a local press dispatch. The incorporators are James C. Parker, of New York; Louis H. Wright, of Indianapolis; Ben L. Ireland, of Nashville; Oscar Mather, of Chattanooga, and John R. Aust, of Nashville.

According to Mr. Parker, who was here to file the charter, the company will operate its plant at Crab Orchard, in Cumberland county, and the plant when completed will have a capacity of 1,000,000 bbl. of cement annually. It will require a year to construct the plant, according to Mr. Parker.

Demorest Reappointed

W. D. DEMOREST, general manager of the International Lime Co., Sumas, Wash., has been reappointed as district advisor for the Manufacturers' Association of Washington state in Whatcom county.

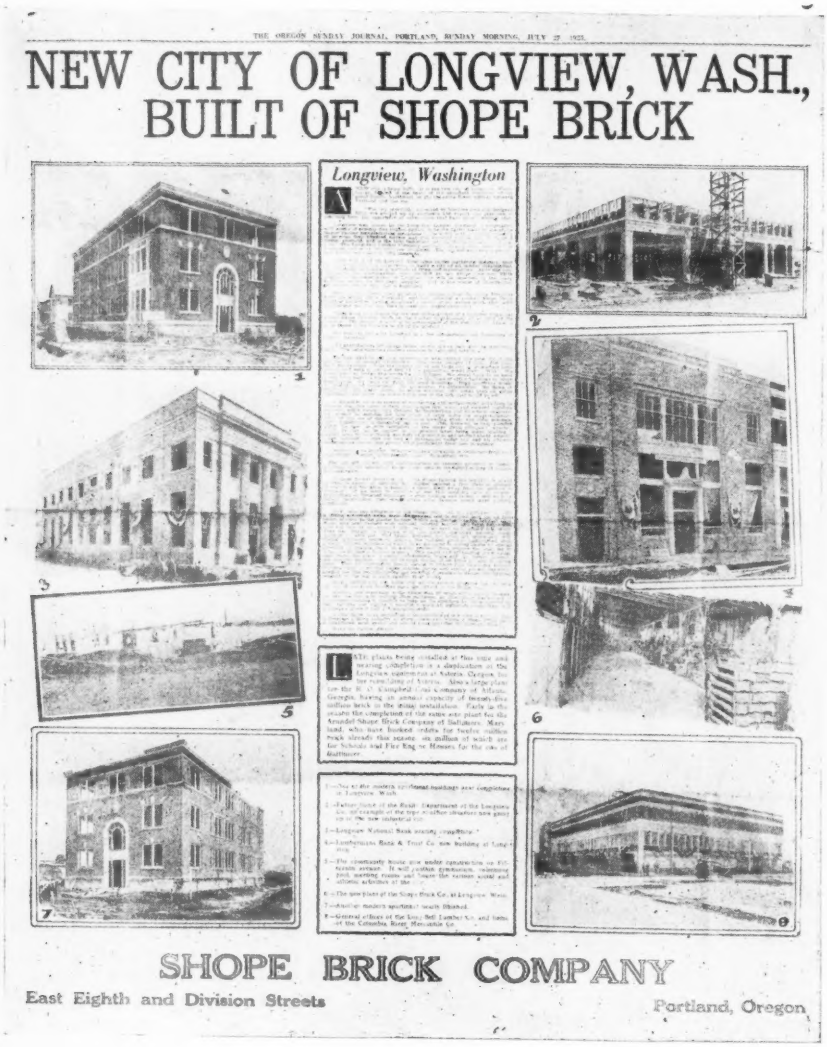
Mr. Demorest's duties are to act in an advisory capacity to the board of trustees of the organization and aid in the upbuilding and strengthening of the manufacturing industries of the state.

Publicity for Concrete Brick

Shope Brick Company Has Full Page Advertisement in the Portland "Oregon Sunday Journal"

THE Long-Bell Lumber Co., of Kansas City, Mo., one of the largest lumber manufacturing concerns doing a nation-wide business, is developing a new mill city in the state of Washington. Neither money nor architectural and engineering talent is being spared to make it a model town. This new city of Longview, on the Columbia river, is probably destined to be one of the most widely advertised places in the Northwest.

Realizing this, the Shope Brick Co., Portland, Ore., is not letting the grass grow under its feet to tell every one in its neck of the woods that after a thorough investigation of the merits of Shope concrete brick, the Long-Bell Lumber Co. is using them in the construction of nearly all its important buildings at Longview. A full-page advertisement in the Portland *Oregon Journal* of Sunday, July 22 tells the story.


NEW CITY OF LONGVIEW, WASH., BUILT OF SHOPE BRICK
Longview, Washington
SHOPE BRICK COMPANY
East Eighth and Division Streets
Portland, Oregon

Nearly 4,000,000 Tons of Gypsum Mined

ACCORDING to a statement issued by the Department of the Interior, compiled from statistics collected by the Geological Survey, the demand for most of the gypsum products was greater in 1922 than in 1921. During the year 3,779,949 tons of gypsum was mined, an increase of 24 per cent over the output in 1921. The sales of agricultural gypsum decreased from 104,966 tons, valued at $490,902, in 1921, to 101,904 tons, valued at $387,203, in 1922. The sales of gypsum for use in portland cement, paint, and other compounds amounted to 668,821 tons, valued at $2,056,143, an increase over the corresponding figures for 1921 of 24 per cent in quantity and of 16 per cent in value.

The following table shows by uses the quantity and value of gypsum sold during 1922:

GYPSUM PRODUCED AND SOLD IN THE UNITED STATES IN 1922 BY USES

	Short tons	Value
Calcined:		
Stucco	396,990	$ 2,813,561
Neat plaster	1,333,261	12,126,811
Sand plaster	80,455	1,165,771
Mixed plaster	*218,650	1,914,572
Plaster of paris, molding, casting plaster, etc.	†126,288	1,198,819
Keene's cement	21,991	324,316
Plaster board	42,088	945,171
Wall board	120,591	4,500,725
Partition tile	68,338	915,449
Roof tile	(‡)	(‡)
Special tile or blocks	44,834	368,068
Other purposes	37,779	644,542
	2,491,265	$26,917,805
Crude	770,725	2,443,346
		$29,361,151

*Includes small quantity of wood fiber plaster. †Includes dental plaster and plaster sold to plate-glass works. ‡Included under "other purposes."

Phosphate Rock Shipments

June, 1923

TAMPA—LAND PEBBLE

Date	Vessel and Destination	Tons
June 2	Ogontz—Pasages	2,650
5	Cody—Amsterdam	3,703
7	Seneca—Baltimore	3,083
11	Ausable—New York	3,490
12	Kjellbergen—Montreal	3,224
12	Tampa—Harvey, La.	603
15	Claverack—Hamburg, Bremen	3,008
16	Federal—Havre	2,511
17	Peter H. Crowell—Baltimore	4,839
19	Blakely—Marcus Hook, Pa.	2,997
19	Tampa—Harvey, La.	610
25	Saugerties—Huelva	2,215
27	Sapinero—Stettin	3,407
	Foreign, 20,718 tons; domestic, 15,622 tons	36,340

BOCA GRANDE—LAND PEBBLE

June 5	City of Weatherford—Aberdeen	2,700
5	Margaret—Baltimore	4,885
6	Lillian—Alexandria	4,500
8	Baltimore Maru—London	3,800
13	Eldean—Garston	2,860
21	Evergreen City—Fredericia	4,200
22	Beatrice—Baltimore	4,900
26	Alexandrian—Dublin	4,400
27	West Tacock—Hamburg	3,119
	Foreign, 21,079 tons; domestic, 14,285 tons	35,364

PORT TAMPA—LAND PEBBLE

June	Foreign shipments	25,661
	Domestic shipments	11,842
		37,503

FERNANDINA—HARD ROCK

June 13	Baltimore Maru—Rotterdam	1,767
18	Mar Adriatico—Stettin	3,150
19	Sundance—Ghent	2,500
22	Hans Hemsoth—Hamburg	4,000
27	Serostris—Hamburg	2,205
		13,622

JACKSONVILLE—HARD ROCK

June 13	Huftero—Bremen	525
13	Huftero—Hamburg	3,165
		3,690

The offices of the Phosphate Export Association and the Florida Pebble Phosphate Export Association will, after July 30, be located at Room 301, Produce Exchange building, New York City. The offices of these associations were formerly located at 2 Rector street, New York City.—*American Fertilizer.*

To Rebuild "Bluegrass" Phosphate Plant

IN INTERVIEWING James A. Barr, consulting engineer of the International Agricultural Chemical Co. at Mount Pleasant, Tenn., two weeks ago, a ROCK PRODUCTS editor was told of the International company's plans to rebuild its No. 3 washing plant, two miles south of Mount Pleasant, known locally as the "Bluegrass" plant.

This plant is one of the oldest in the district, having been built early in 1911 and remodeled in 1914; additional improvements were also made in 1918. As it now stands, it is equipped with jet washers and auto-

James A. Barr, consulting engineer of the American Agricultural Chemical Co., Mount Pleasant, Tenn., district

matic classifiers, two rotary driers and a wet storage with overhead electric traveling crane. In addition, the operation has its own power and pumping plants.

The power, pumping and drying plants will remain practically as they now stand and will receive only minor repairs. The washing plant, however, will be completely rebuilt and its design will embody a system for washing and saving the fine sand which heretofore has been stored in a "tailing" pond.

Plans for this new unit are being drawn up by Mr. Barr and in doing so, he is preparing three different sets. One set will call for a plant of steel construction; another for a plant of creosoted-timber construction, and the third, for one of pine. It is estimated that a plant built of pine will last for the working out of one-half the remaining deposit and that one of either treated timber or steel will serve for the entire life of the deposit. The only advantage of a plant of steel construction over one of treated timber is that when the deposit is worked out, the plant will have a salvage value; whereas, a creosoted plant will be valueless.

Mr. Barr is making a careful study of all these points and in his final choice will select the type of construction that will be most economical with consideration given to the life of the deposit.

The new plant will consist of two 25-ft. double steel log washers and an 18-ft. conical trunnion screen of the company's own design which will be made especially for this plant. One of its features will be locomotive-steel tires. There will be five jet tanks, one of which will be 16 ft. in diameter and the rest 12 ft. The overflow from these will be received by a 60-ft. Dorr hydro-separator. The product of all the jet tanks will be sluiced to two 8-ft. triple-deck Dorr classifiers and from them it will drop directly into storage, from which it will be recovered in the same manner as it is in the existing plant—by traveling crane. The overflow from the two classifiers will also be directed to the hydro-separator. The overflow from the hydro-separator will be jetted to a special type Allen sand-washing cone, which will be followed by two 8-ft. dewatering cones of the same make.

According to all reports available, this plant, which produced 99,000 tons last year working in a single shift, established a production record for a single-unit plant. After being rebuilt, the plant is expected to attain an output of 110,000 tons, which, Mr. Barr believes, will be made possible by the installation of equipment for saving the fine sand which has in the past been wasted. Actual construction will be started about January 1.

The washing plant as it now stands. The plant which will take its place will have a yearly capacity of 110,000 tons

Little Rock to Have New Sand Plant

AN acre of ground has been purchased by A. B. Gerlach and Sam Bittles from the Arkansas Water Co. at Little Rock, Ark., on which will be erected a modern sand plant, according to a local newspaper. The tract lies east of the Missouri Pacific bridge, extending east along West Washington avenue to the property of the Wilson-Wrape Stave Co., and south to the Arkansas river. This will afford a river frontage the entire length of the tract on the south and a street frontage on the north.

The owners plan to build one of the most complete sand plants in the Southwest, equipped with dredges capable of putting out 1000 yd. of sand a day. Arrangements are being made with the Missouri Pacific to build a spur track to the plant which will enable the company to load 10 or more cars daily. The local demand for sand is increasing rapidly, it is said.

Another Cement Plant for China

By M. H. CHOU

IT is reported that another new cement plant will be started by the Ching Ching coal mine in the north of China. The principal stockholders are men of political importance, such as President Li Yung Hung, ex-Premier Tuan Chi-je, and others. General Ting is the general manager of the company.

The capacity of the plant will be 2000 casks per day. Many prominent American and German import and export companies have bid for the contract for the complete set of equipment. It is expected that the plant will be under operation sometime in 1925.

Phoenix Cement Co. Not Mixed Up in Dollings' Deals

IN VIEW of the newspaper publicity recently given to certain proceedings instituted by stockholders against the R. L. Dollings Co. of Pennsylvania, the R. L. Dollings Co. of Ohio, the R. L. Dollings Co. of Indiana, and various corporations controlled by those companies, a word of explanation is perhaps appropriate, states President Lindley C. Morton, of the Phoenix Portland Cement Co., of Birmingham, Ala. He says further:

"Our company is a corporation of the state of Pennsylvania, which now owns and for many years past has operated and owned a cement plant at Nazareth, Pa., and which is now also operating a plant at Birmingham, Ala.

"Within the past year the Dollings interests organized a corporation under the laws of Ohio, named '*The* Phoenix Portland Cement Company' and that company endeavored to acquire control of our capital stock, but the negotiations were abandoned and, as a result neither 'The Phoenix Portland Cement Company,' the Ohio corporation, nor the Dollings companies, nor any corporation controlled by them or in which they are interested, owns any stock or bonds of our company or in any way controls its affairs, nor does our company control or own any securities of any of the Dollings companies or any of their subsidiaries.

"Our company is in no way connected with, involved in or affected by any of the litigation above mentioned, and will continue to do business as heretofore."

A Columbus, Ohio, dispatch under date of July 31 states that the receipt of this information from President Morton led to announcement that there will be an investigation to determine whether stock in the Dollings' Ohio company was sold upon representation that it actually owned property in the other states. The president of the concern is said to be Findley O. Morton, a close resemblance to the name of the head of the Birmingham company. The Ohio organization was first incorporated nearly two years ago for $5,000,000 and then increased to $10,000,000.

The first estimate of 80,000 stockholders involved in the dealings of the Dollings' Ohio companies also has been considerably reduced by subsequent investigation. It is now believed that probably only between 30,000 and 40,000 persons are affected. The reduction is attributed to the fact that many persons hold stock in several different subsidiaries. It is estimated there are about 15,000 stockholders in the International Note and Mortgage Co. and about 8000 in the R. L. Dollings Co. of Ohio.

An accurate idea of the scope of the dealings of the company probably will not be forthcoming for some time. There are probably only two persons in the country who know the amount of stock sold under the Dollings plan, William G. Benham, president, and Dwight Harrison, vice-president, and both steadfastly refuse to discuss the situation.

It also will be some time before there is any decision on the question of whether or not criminal activity has been involved in the case. Assistant Prosecutor Godown, who is investigating this end of the case in the absence of Prosecutor King, said recently he had not sufficient information to make a definite statement.

Missouri Asks Bids for Opening and Operating Stone Quarry

A RATHER unique contract is asked by the State Highway Commission of Missouri in a proposal advertisement in local newspapers. Bids were to be opened August 11 on a proposal for opening and operating a stone quarry on the property of Reuben George, located in Section 3, Township 48, Range 21, Saline county, Missouri.

The proposal reads:

The proposed work includes:

Excavating preparatory to quarrying, disposition of unsuitable material so as not to damage adjacent property and future operations; furnishing all necessary labor, machinery and equipment; crushing and storing stone in the minimum number of piles best suited to the economic operations of the quarry. Approximately 62,500 cu. yd. of stone will be required from this quarry site.

Multiple or combination bid will be considered as follows: Combined bids will be received for work on any two or more quarry locations as follows: George quarry, Saline county; Harraman quarry, Cooper county; Sweet Springs quarry, Saline county.

Proposals shall be submitted upon blank forms provided for the purpose by the undersigned and shall be accompanied by a certified check made payable to the "Treasurer of the State of Missouri, to the credit of the State Highway Fund," for 5 per cent of the amount of the bid. A proposal bond cannot be accepted in lieu of a certified check, and a bid when accompanied by a proposal bond will be automatically rejected.

Fifty per cent of the quantity of the material stipulated herein to be in storage by June 1, 1924, the balance by October 15, 1924.

Payments will be made on monthly estimates, but should not be expected prior to the last of the month for the estimate of the preceding month.

(Signed)

B. H. PIEPMEIER, Chief Engineer,
State Highway Department.

Death of Miss Kathrine Sandles

IT is with the deepest sympathy that ROCK PRODUCTS announces the death of Miss Katherine Sandles, daughter of Secretary A. P. Sandles of the National Crushed Stone Association, which occurred on July 26, in her sixteenth year.

Miss Sandles' untimely death was the result of an automobile accident. She died only two hours after the accident at her home in Ottawa, Ohio. She was a singularly beautiful character and an ideal daughter.

Mr. Sandles said that "No child of parents ever more truly lived the rule of 'Honor thy father and thy mother.' Within our family fold, in meek and modest ways of always giving service to others, she gained and held a gentle sway of power which God gives only to those whom He loves and chooses to work out His will and His way."

The sympathy of the industry goes out to Mr. and Mrs. Sandles in their loss.

Foreign Cement for the West Coast

THE shortage of cement which has held up building operations at San Pedro, Calif., harbor will be relieved in part with the arrival of the Danish motorship Leise Maersk from Hamburg carrying a full shipload of building materials for the port, says a news item in a Long Beach newspaper.

There are 3000 tons of cement in the cargo on the Danish vessel, according to Sam Cappelie, manager of the port of Los Angeles Stevedoring and Ballast Co.

A Los Angeles newspaper states that because of the temporary shortage of cement and the difficulty of securing structural steel from the East, Los Angeles construction engineers are importing large volumes of both commodities from Antwerp. Recently the motorship Dinteldyx of the Holland-America line discharged 4000 tons of cement at Los Angeles harbor, which was consigned to construction firms at Los Angeles.

The S. S. Cardiganshire of the same line was due to arrive the 28th of July with 2000 tons of cement and 500 tons of structural steels, according to C. J. Leman, agent for the company. Mr. Lehman says the importation of cement is a development of the last 30 days in reflection of the urgent needs for material to complete projects under way. A portion of the imported steel comes from England and is designed for use in oil-storage tanks.

On July 11 the Norwegian freighter Ranenfjord arrived at Long Beach with 2200 tons of cement. John McLaurin, agent for the ship, stated that the inability of producers of cement in California to keep pace with the demand will cause a large quantity of the product to be carried to this port in foreign vessels during the remainder of the summer.

July Construction Dropped 15 Per Cent

JULY was the second consecutive month of declining construction volume, according to the F. W. Dodge Corporation. Total contracts awarded in the 36 Eastern states amounted to $315,024,000. The drop from June was 15 per cent; from July of last year, 22 per cent.

Roche Harbor Lime Plant Destroyed by Fire

DAMAGE estimated at from $50,000 to $750,000 (by local newspaper reports) was done by a fire which destroyed the plant and wharves of the Tacoma and Roche Harbor Lime Co., at the north end of San Juan Island, say recent news dispatches from the West Coast.

The president of the Tacoma and Roche Harbor Lime Co., Commodore John S. McMillan, is one of the best known men in the northwest. Every year about this time he has held a festival and barbecue at Roche Harbor for his friends and employes. Only recently he announced that on account of ill health he would have to forego that pleasure this year. His present misfortune will be keenly felt by a host of friends throughout the entire country.

However, with the usual spirit of the part of the country in which he lives, he is coming back strong. Under date of August 4 he writes ROCK PRODUCTS as follows:

"Our loss was not nearly so serious as indicated by some of the newspaper reports, but it was bad enough, nevertheless. We have been trying to make a record in digging out from under the heap of ashes and wreckage since the fire occurred, and have succeeded, at the end of the sixth day since the fire, in getting two of our kilns in operation and will have more going very quickly. If you were here you would probably be able to discover some ashes in our whiskers and smoke in our hair, but we are on top of the world and going strong. Within a very few hours, our product will be pouring out of our kilns, just as white and pure as ever.

"We are crowding the reconstruction of our plant as rapidly as possible. We had quite a nice insurance, which will be of great assistance to us in rebuilding.

"We had just shipped away from the plant over 11,000 bbl. of lime, during the period of four days immediately prior to the fire. This represented a value of more than $20,000, and we consider ourselves very fortunate that it was not caught in the storm. We had very little lime on hand at the time of the fire—only 1349 bbl., and that was fully insured.

"We enclose herewith a copy of our letters to our dealers, sent out immediately after the fire. This explains the situation as we saw it then, and we are making our promise good, as outlined in that letter."

Letter to Dealers

Singed, but not discouraged! Scorched, but not dismayed.

You have doubtless read of our misfortune by fire. The facts are bad enough, but not nearly so disastrous as would appear from some of the broadcasted stories. We greatly appreciate the kindly solicitude and sympathy which has prompted so many of our business and personal friends to phone, write or wire us, or to call in person, to express their interest and sympathy.

Our original No. 1 battery of kilns was not touched by the fire, and will be in full blast within four or five days, and we do not anticipate the need of turning down a single order. We may have to delay some for a very few days, but trust none of our good friends and customers will look elsewhere for a supply of lime, as that will not be necessary, and we need their orders now more than ever.

Even our kilns in battery No. 2 are uninjured by the fire. The buildings, kiln bunkers, trestles, wood elevator, etc., were destroyed, but will be replaced at once. Work of reconstruction had commenced before the fire was extinguished, and that battery will soon be doing good business in the same good old way, and with the same good old ROCHE HARBOR product.

Our homes and our hotel are intact, and our people have "all the comforts of home," need no assistance, and despite the unavoidable inconvenience, with brave hearts have turned their attention from fighting the fire to the work of reconstruction.

While our loss will be heavy, we have a good insurance, and as our demand is excellent now, we hope soon to recover all our lost ground. We ask only the forbearance and patience of our many friends, and trust that not one of them will forget that ROCHE HARBOR LIME will be just as good and just as reliable for the next 40 years as it has been for the past 40 years; and that your orders in future will demonstrate your desire (which we know you feel) to help us make the earliest possible recovery from this misfortune.

Yours very truly,
TACOMA & ROCHE HARBOR LIME CO.
By John S. McMillan, President.

Carthage, Mo., Negotiating for New Cement Plant

PROSPECTS for bringing a cement plant to Carthage for the manufacture of cement to be supplied in the construction of concrete roads in Missouri looks favorable, although no definite decision on the proposition has been reached, according to Jay Corby, secretary of the Carthage Chamber of Commerce, and Harry Marks, chairman of the industrial committee of that organization, who were recently in conference with men interested in locating such a plant here, according to a local newspaper.

It is said the men interested consider Carthage a logical location for the plant, but desire more information about the city before locating there. It is said the plant, if constructed in Carthage, will be of considerable proportions and its operations will be continued after the road building programs are completed.

Bound Brook Co. Plant Burned —Rebuild at Once

THE crushing plant of the Bound Brook Crushed Stone Co., Chimney Rock, N. J., was destroyed by fire July 26. Sparks from a smokestack are said to have caused the blaze. The loss is said to be in the neighborhood of $250,000. The owners have announced that the plant will be rebuilt at once.

Somerset county and many of the townships in Somerset depended upon the plant for the supply of stone for the maintenance of roads and a number of contractors who are building state and county roads also secured their supply from Chimney Rock. Stone was shipped by rail to many parts of the state and so important was the supply at Chimney Rock that the New Jersey Central several years ago constructed a branch from the main line at Bound Brook Junction in order to get out the supply.

During the years in which the quarry has been located at Chimney Rock, the west spur of the mountain has been torn back a quarter of a mile by the excavations and many thousands of tons of stone have been distributed on the roads in New Jersey.

Charles V. Higgins, a well-known member of the National Crushed Stone Association, is the head of the Bound Brook Crushed Stone Co.

Chemical Exposition Plans

AN exhibit showing what chemicals have done in the development of the radio will be one of the educational features of the Chemical Exposition at the Grand Central Palace, New York, during the week of September 17 to 22. Any exhibitor who manufactures products which in any way enter into the field of wireless telephony, will be permitted to place his products in this special radio exhibit.

Tickets will be sent to exhibitors by August 20, so as to permit mailing them in time to reach customers and friends early in September.

About 50 American manufacturers of fine precision instruments of types all the way from high-pressure gages to ultrafine chemical balances, will show their goods. More than an equal number of manufacturers of all kinds of chemical and allied plant equipment such as centrifugals, screens, crushing machinery, pumps, acid-proof ware, valves, gears, pipes, drying equipment, filter presses and the like, will show their goods.

The glass industry will see its products from both ends of the manufacturing scale. Numerous displays of finished bottles, jars, carboys, laboratory equipment, etc., will be shown, in addition to the usual full line of chemical raw materials for the glass manufacturer.

Kansas Cement Co. to Start Its $1,000,000 Improvements

CONTRACTS for the erection of a new kiln building and a large smokestack have been let by the Kansas Portland Cement Co. at Bonner Springs, Mo. The work will begin early this month, the officials have stated.

This is the beginning of the million-dollar improvement program of the company announced at the time of the purchase of the plant from the Bonner Springs Cement Co. last spring. Vice-President J. A. Lehaney has stated that the building program would be completed about next May. The plant will not cease operation during the construction period.

Thousands Saved Yearly in Time and Labor at Two Chicago Quarries

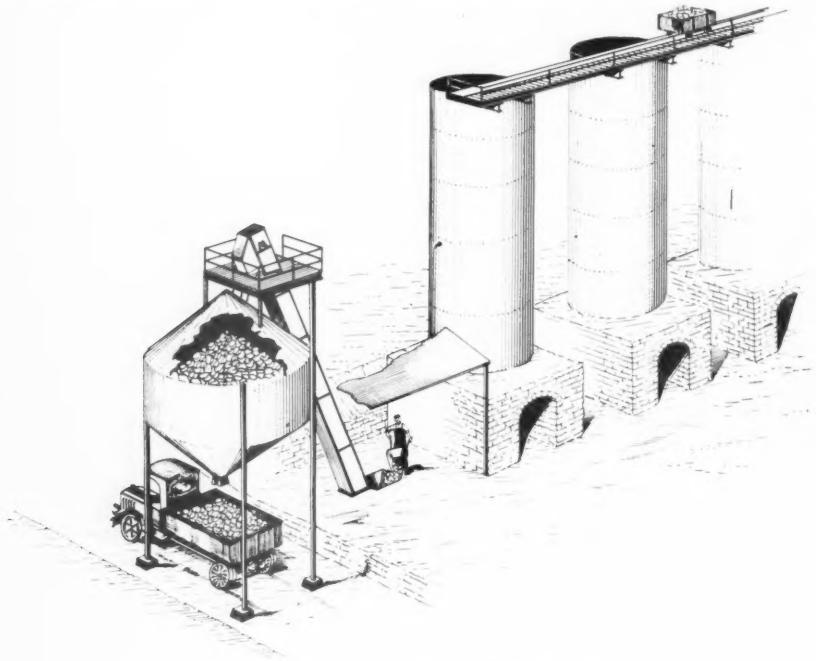
By C. S. Huntington
Engineer, The Link-Belt Co., Chicago

Some of the Methods Employed Not Only Saved from $6000 to $10,000 in Costs and Delivery, but Also Effected a Great Reduction of Fines and Breakage

THOUSANDS of Chicago's citizens and visitors sit comfortably in certain Chicago street cars or deftly guide their automobiles through crowds of children playing in West Nineteenth street, without so much as losing a word of conversation or breaking their train of thought on bills unpaid, stock-exchange fluctuations, or the vagaries of the labor situation—little guessing that 12 ft. beyond the 10-ft. plank fence which borders one side of these streets is a hole presenting a sheer drop of from 200 to 350 ft.!

And from these same holes—(deep and wide enough to permit the famous old Masonic Temple or the Montgomery Ward building to be set inside without their roofs or peaks reaching street level)—emanates one of the year's most interesting accounts of the economy effected by material handling equipment—added evidence of the advisability of employing mechanical means instead of hand labor wherever possible.

The first statement comes from one of Chicago's large lime quarries telling of a continuous bucket elevator and overhead storage tank erected for delivery-truck loading purposes. This equipment consists of continuous elevator buckets attached to a heavy 18-in. pitch chain which travels on Flint-Rim rollers over a T-rail track, the whole being completely housed. This elevator lifts the lime, still hot from the kilns, to an overhead storage tank having a capacity of some 80 tons. The elevator was designed and installed by the Link-Belt Co. of Chicago.



Design for labor-saving in handling lime

Briefly, this equipment accomplishes seven things: 1. It cuts four men from the payroll; 2, loads a truck in 3 min. with one man instead of 45 min. with three men; 3, permits all trucks to be on delivery at 7:30 a. m. instead of 9:30; 4, cuts handling costs from 5 cents a barrel to 1 cent; 5, increases the dealer business fully 80 per cent; 6, pays for itself in one year; 7, the net annual saving, in labor costs alone, totals $5703. This surely is quite enough to make any superintendent congratulate himself on his good buying judgment.

Prior to three years ago this plant drew the lime from the kilns in barrows and wheeled it to the loading platform where it was dumped in piles. Here it awaited the trucks and wagons. Once in place, it took three men from 30 to 45 min. to load. During the summer months the labor turnover on this job was very high; figured at 50 cents an hour, it cost considerably more than 75 cents to load one truck. Furthermore, the time consumed in loading prevented the trucks from getting an early start on deliveries. Seldom, if ever, was the fleet at work before 9:30. This of course greatly increased the delivery cost compared with the present system, although for this item there are no definite figures.

For the past three years this company has been operating a Link-Belt continuous bucket elevator and overhead storage tank. The actual loading expense is about 2 cents (as against 75 cents with man-power) and the time required is 3 min. (as against 45 min. with man-power), the loading being done with one man instead of three.

This loading speed permits every truck to be on the job by 7:30 in the morning and has cut the handling cost from 5 cents a barrel to less than 1 cent.

Because of this reduction in time and expense, contractors and dealers buy lime from this company in preference to other sources. The superintendent states that since the installation of the overhead tank and elevator the dealer business has increased at least 80 per cent. The magnitude of this increase can be readily appreciated if one will take arbitrary figures as representative, or use your own figures.

Reduced to actual figures, the installation has meant: 1, an investment of approximately $6500; 2, an operating expense as follows:

Interest on the investment, 6 per cent	$ 390
Depreciation on 10-yr. basis (conservative)	650
Annual repair charge of 5 per cent (very conservative)	325
Kilowatt input for operation	120
Oil, 2 gal. per month, at 50 cents	12
Total, annual, operating costs	$1497

Reducing the handling costs from 5 to 1 cent per barrel, and with an average output of 600 bbl. per day, means:

600 bbl. at $.04	$ 24
300 working days at $24	7200

Subtracting the operating costs from the gross saving gives:

Gross saving	$7200
Operation costs	1497
Net, annual, saving	$5703

Since this represents the saving in labor alone, it is easy to concede that the increase of 80 per cent in dealer business, together with the speeding up of deliveries, would make up the difference between this figure and the $6500 initial investment cost, which makes the installation pay for itself every year.

A second statement, of even greater interest and showing more decided saving, comes from the Chicago Union Lime Works at West Nineteenth street. The equipment represented is almost identical with that of the former company, and the comparison, for the greater part, is made between the mechanical means and hand labor. Because of the similar nature of the equipment and the way in which this equipment is handled, the method of figuring the operating costs is the same as in the former case.

Therefore taking the debit side of the ledger, we have an approximate annual operating cost of $1500 and for that which must appear on the credit side we find that this equipment eliminates four men at the kilns. Instead of drawing the lime, wheeling it in barrows to the loading platform, dumping it, then rehandling it with a shovel when wagons or trucks were available, as formerly, the elevator and overhead tank take care of the loading because the lime is handled but once—it is wheeled directly from the kilns to the elevator.

By this method the company is now able to use 90-bbl. trucks instead of from 30 to 35-bbl. wagons. This greatly reduced delivery costs. It is possible to load a 90-bbl. truck in 2 min. with one man where formerly it required 2 men 30 min. to load a 35-bbl. wagon. Loading the truck by the dump method makes disposition of all fines and breakage regularly, thus saving the waste that once resulted from shoveling the lime from the platform to the trucks and in handling the material twice. This waste elimination is estimated to be 1 per cent of the total production, which, reckoned in dollars and cents, is:

1 per cent of 666 bbl. (daily output), bbl.	6.6
6.6 bbl. at $1.50 per barrel	$ 9.90
300 working days at $9.90	2970.00

This item represents the saving in waste lime.

The eliminations and short-cuts in labor decreased the handling expense from 5 to 1 cent a barrel. With an average production of 200,000 bbl. a year (666 bbl. a day), this saving equals:

666 bbl. at $.04	$ 26.64
300 working days at $26.64	7992.00

Adding the two items of economy we have:

Saving in labor costs	$ 7,992
Saving through elimination of waste	2,970
Gross saving on annual basis	$10,962

After subtracting the annual operating costs from the gross saving, $10,962 minus $1500, we have a net annual saving of $9462.

Nor does this reckoning take into consideration the customer benefit in speeding up deliveries, rapid handling of trucks, or preventing chill and freezing of the lime during winter, because of the red hot lime being placed on top of the cold lime in the overhead tank, thereby keeping it at a temperature convenient for slaking. All of these elements are bound to reflect themselves in the volume of business done and the amount of money made, but for these there are no figures available.

Considering the initial investment at $2000, this saving represents a turn-over in less than three months. A great many retail merchants would be glad to turn over their stocks on a basis of four or five times a year, particularly those merchants handling $2000 items.

Wolcott Is Appointed District Manager of Car Service Division

THE Car Service Division of the American Railway Association has appointed Charles F. Wolcott a district manager, with headquarters in Pittsburgh. Mr. Wolcott will have authority in the following territory:

New York and Pennsylvania: West of the line of District 8, Sodus Point, N. Y., to Harrisburg, Pa. (not including Harrisburg). Pennsylvania and Maryland: North of and including line of the Pennsylvania railroad, Harrisburg, Pa., to Hagerstown, Md.; Western Maryland railroad, Hagerstown, to and including Cumberland, Md. West Virginia: Baltimore & Ohio railroad, Cumberland to Parkersburg, W. Va. (not including Parkersburg). Ohio: East of line of District 4, Parkersburg, W. Va., to Mansfield, Ohio. Ohio, Pennsylvania and New York: Southeast of line of District 2, Mansfield, Ohio, via Erie old main line to Buffalo, N. Y. (not including Buffalo, Niagara Falls or Suspension Bridge Terminals).

Big Crushed-Stone Contract Possible in Missouri

THE Missouri State Highway Commission will open bids at Jefferson City on September 5 for the supplying of crushed rock and gravel to the state for road construction, according to C. W. Brown, first assistant highway engineer, who was in St. Louis recently.

Mr. Brown is quoted as saying that many contractors had complained that they had great difficulty in obtaining material for carrying out their contracts, which led the commission to consider the question of undertaking to supply crushed rock and gravel on its own account.

If satisfactory bids are obtained contracts may be awarded to one or more bidders to supply material for a period of five years, Mr. Brown said. He estimated that 4,000,000 tons of crushed stone will be needed during that period.

If the state goes into the business of furnishing stone and gravel to contractors, bids for road construction would be awarded upon that basis in the future, he said.

Lime Requirements of New Hampshire Soils High

THE lime requirements of the soils of New Hampshire average around 5000 lb. of ground limestone per acre, according to data reported in New Hampshire Bulletin 208.

These data were obtained as a result of testing 587 samples of soil from eight counties by the Agricultural Chemistry Department of the Experiment Station using the Truog test.

The importance of lime in the development of the extension project for more legumes in the state has been emphasized more and more during the past few years, and the apparent need for it is shown by the soil acidity tests and the clover failures.—*Bulletin No. 68, National Agricultural Limestone Association.*

State Topographic and Geologic Survey Will Study Pennsylvania Slate Deposits

THE slate deposits in northeastern Pennsylvania are being mapped and studied in detail this summer by the Pennsylvania Topographic and Geologic Survey. The work is being done by C. H. Behre, Jr., of the department of geology, Lehigh University, under the direction of R. W. Stone, assistant state geologist.

Mr. Behre will pay particular attention to the structure of the slate formation, the relation of good slate to faults and folds, and other structural details that affect the quarrymen's operations. Members of the National Slate Association are showing their interest in the work by hearty co-operation with the geologists

Hints and Helps for Superintendents

Concrete Post Form

THE view herewith illustrates a well-known construction kink, but since it is applied here to sand and gravel bin construction, we pass it along. A simple and effective method of making foundations for the bin posts consists of placing an old barrel into which the post is set, and concrete filled in around it. The looks of the finished job may be improved if the barrel is subsequently removed. This concrete serves to protect the post

A simple method of making foundations for bin posts is to place an old barrel into which the post is set, filling concrete around it

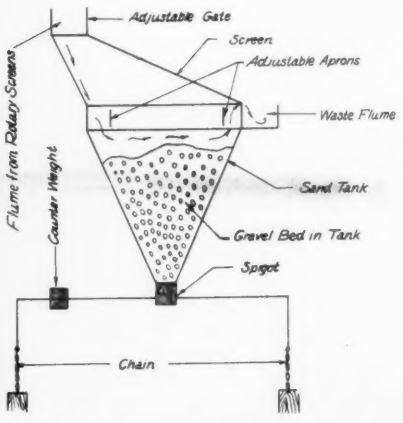
from collisions with cars and trucks as well as a foundation. We have seen gravel-plant bins badly damaged by careless truck drivers. With post footings like the one shown, truck drivers will be more apt to use caution.

Controlling Operation of a Conical Sand Settling Tank

IN the operation of the ordinary conical sand settling tank there is always the danger of the discharge spigot clogging up and thus flooding the tank or just the reverse case—the spigot becoming wedged in such a manner as to allow both sand and water to flow through freely, which not only cuts off the dewatering action of the tank but also gives an unclean product.

The accompanying drawing shows a device used by a practical sand and gravel man to control the operation of the tank. It consists merely of a system of levers and counterweights which allows the spigot to open and close only within certain limits and avoids danger of flooding or spilling.

The sand and water comes to the tank in a flume from the rotary screens. At the discharge end of the flume is an adjustable gate, which allows the material to go either to the cone or to the waste pool. In going to the cone the material first passes over a screen, pivoted at one



Device for controlling the operation of a conical settling tank

end so that it can be drawn up out of the way. It is set at a 30-deg. angle of inclination. This takes care of objectionable matter, putting it to waste flume direct.

The launder of the cone has adjustable aprons which control the flow of the material and as the gravel bed is maintained in the tank, the silt and water is siphoned off into the waste flume.

In discharging the sand the spigot opens and the counterweight goes up, lifting the chain attached to the block. Thus the spigot can only open within certain limits, set so as to prevent the material from running out. On the other end of the spigot is also a lever and chain, set so as to prevent the spigot from shutting too tightly and causing the tank to flood. This device was put in operation very successfully by R. Snoddy, of the Coon River Sand Co., Des Moines, Ia.

Sampling Sand and Gravel Properties

THE device illustrated below was described in ROCK PRODUCTS several years ago, but requests for devices and means of sampling sand and gravel deposits are so numerous that it is published again here in hopes that this description of the device will be read by some who are not already familiar with it.

The purchase of sand and gravel properties is too often conducted in a "pig in a poke" method. Even in the case of established plants the acquisition of adjoining property in the expectation of expanding operations has frequently met with dismal disappointment, both from decided differences in the character of the material and sometimes in its almost total absence.

Most workable inland gravel deposits are either the results of deposition by rivers and streams, or are glacial deposits. In the case of former stream deposits, the sand and gravel may end abruptly at the confines of the bed of the ancient stream, with very little surface indication of where these were. The character and coarseness of the

Device for sampling sand and gravel property

the center of the current or stream at the time it was deposited and in crossing this deposit laterally the change may be considerable. In a general way of course the same applies to glacial deposits, since these material will vary with its distance from

were made by ice streams, instead of streams of water.

No gravel deposit should be made the basis of a permanent investment until it has been sufficiently explored to give the operator a fairly comprehensive knowledge of the material he will have to deal with.

Where it is necessary to dig test pits the device illustrated herewith will be found convenient and efficient, and it can be readily made in any plant machine shop. It consists merely of a four-legged pipe-frame derrick, a couple of pulleys and a small-size clam-shell bucket. Buckets of this character are made which have a spread of only 8 or 10 in. when open. If the pits are deep they can be lined, as in this case, with vitrified or clay sewer pipe of any convenient diameter, depending on the size of gravel to be expected. By this method an accurate log, or record, may be kept of the character of the material at every foot or two of depth. With a sufficient number of these test pits an operator can estimate with accuracy just what his percentages of sand and gravel of various sizes will run, and in what parts of his pit he can find particular kinds of material. While all this may look like unnecessary refinement, some very experienced and prosperous operators find that it is insurance.

Anchoring the Crusher Dust Cap

AT the older crushing plant of John S. Lane & Son, Westfield, Mass., apparently they have had trouble with the dust cap coming off the head of the initial gyratory crusher. So, in case such a mishap should occur again, they have anchored the cap to the floor near the crusher with a piece of wire rope. The rope does not appear to give any trouble in the use of the crusher, and is "safety-first" for the crusher, should the cap become detached. Presumably the crushers are of an old type and perhaps no one has the same trouble with newer ones. However, it is a kink that may keep some other superintendent from running a dust cap through his crusher before he finds out it *can* become detached.

Anchoring a crusher dust cap to save the crusher

Wire-rope anchor does not seem to be in the way

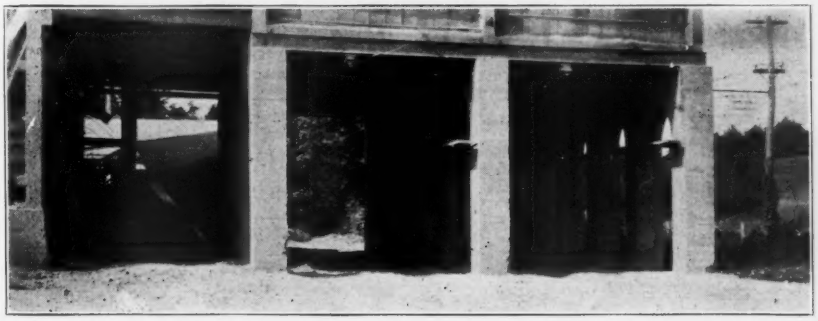
Steel and Concrete Bin

THE two views below show a method of bin construction used at the crushing plant of the Hartford Sand and Stone Co. near Farmington, Conn. It is not a new method of construction but its application to bin-floors is unusual; but has here proved very satisfactory.

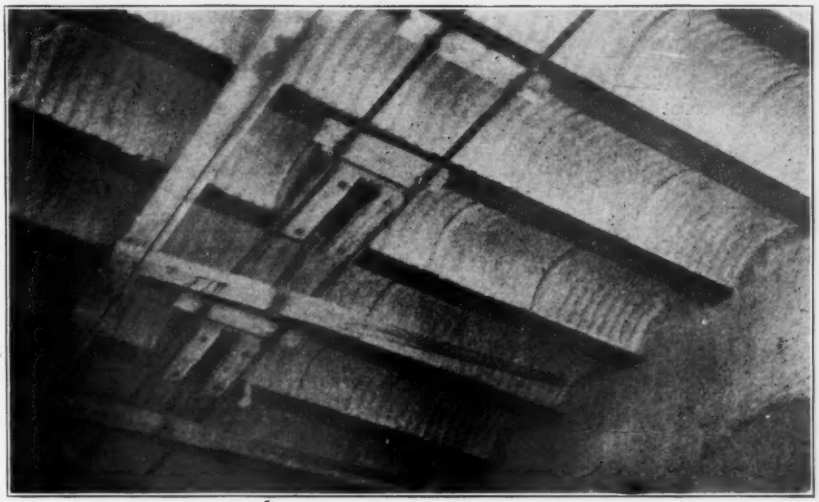
The spacing and depth of the I-beams will of course depend on the depth or capacity of the bin and the dimensions of the bin. In this case 12-in. I-beams spaced 18 in. c. to c., the span being about 10 ft., were used.

The galvanized-iron arches between the I-beams serve as forms for placing the concrete and leave a neat, clean-looking job. The depth of concrete over beams is 6 in.

This plant was designed and built by Albert L. Worthen, vice-president of the Connecticut Quarries Co. It was subsequently sold to its present owners.



Concrete and steel bin construction for crushed stone or gravel



Detail of bin construction showing galvanized plates used as forms

No Liberalization of Immigration Laws*

Outlook Is That Congress May Tighten Present Provisions—Selective Methods Are Being Given Careful Consideration

WASHINGTON, Aug. 7.—Efforts looking to the liberalization of the 3 per cent immigration law apparently will be futile. While for a long time the sentiment of the country seems to have been directed against further letting down of the bars, large employing interests have been urging that this is necessary if relief is to be obtained from the shortage of labor.

Easily the iron and steel industry is one of the outstanding examples that typifies this situation. With plans now actively under way for the elimination of the 12-hr. day, the problem of the industry has become increasingly difficult. The fact may as well be faced, however, that no matter how plausible may be arguments to relax the immigration laws, every indication appears to point toward the improbability of such action by Congress.

Selective Immigration Favored

The truth of the matter is that the tendency is toward tightening the law. There can be no doubt that industrial interests as a class have become thoroughly convinced of the need of selective immigration, though on a more generous basis than now is allowable, but running counter to this view is that of administration officials and many members of Congress, and President Coolidge is expected to continue the Harding policy on this question. Because of this it would be wide of the mark to charge propaganda of organized labor with complete responsibility for restrictive legislation enacted and which perhaps is in prospect.

No doubt, it is pointed out, the active campaign that always has been carried on by organized labor for the limiting of immigration has been effective to a substantial degree, but likewise it is held to be true that organized labor found a strong public sentiment back of it in the past for a certain degree of restriction, though this does not imply that approval was given to the insistence of organized labor upon the so-called literacy test. Rather, it is maintained, the country as a whole saw that under previous laws many of the immigrants constituted a hodge-podge that was excessive in quantity but lacking in quality. It was contended that while this did afford a greater source from which to draw laborers, relatively the supply was small for either the factory or the farm, with the result that a large number of undesirables were thrown upon the country, many of them willingly disposed of by their native lands.

The National Industrial Conference Board in a recent report on "The Immigration Problem in the United States" surveyed at great length the present 3 per cent law, in which it urged many far-reaching changes and improvements, but it went on record in favor of consideration of the human side of immigration and declared that a selfish economic attitude alone will not serve. It treated the subject from an extremely broad point of view and took into account national and international social questions as well as economic progress. It also pointed out that injustices and inconsistencies arising from imperfect administration should, if possible, be avoided in the future and went on to say that the State Department and Department of Labor do not work in harmony. It urged more careful selection through passport vises.

The report on these points appears to accord with recommendations of Secretary of Labor Davis, who now is abroad studying immigration law, and with the report just made to the Department of Labor by Mrs. Muriel Lynch Crichton, who was sent to Europe by Secretary Davis to study details there. It is reported here that Secretary Davis since his arrival in Europe has become even more firmly convinced than ever that the process of selection of immigrants to the United States should originate with American authorities abroad through vises of American consuls, rather than permitting foreign governments to permit indiscriminate emigration from their countries.

Keeping Out Undesirables

Mrs. Crichton in her report made recommendations that are known to meet with the approval of Secretary Davis and which he is expected to attempt to have incorporated in law at the next session of Congress. She said that there must be a selective method of admitting immigrants to the United States to keep out a great many undesirables who could enter under the present quota plan of admission. She goes so far as to say that it appears "as if some governments are sending their social inadequates to the United States to avoid their custodial care."

The present method of selection is also held to invite immigrants of a lower plane of intelligence than is necessary to American citizenship. She also points out that too often passports are vised abroad only to have the alien denied admission at Ellis Island. The result is a hardship on all concerned. Mrs. Crichton favors the setting up of a clearing house abroad and suggests that it might be established at London, where all passports could be vised and the fact definitely established whether or not the applicant would be admitted. It is the opinion of Mrs. Crichton that if there is any change in immigration legislation, it should be in the direction of tightening rather than relaxing requirements.

Labor from the South

This is taken to reveal accurately the tendency toward the immigration problem. For this reason many iron and steel manufacturers and other employers have reached the point where they no longer are depending upon immigration from Europe as a source of any great labor supply. This already has caused them to turn to Canada, to which country the immigration law does not apply and also to negroes and Mexicans.

From these sources the iron and steel industry has to depend mostly on negro and Mexican labor, and there now has developed a large influx of these classes in the iron and steel plants. Curiously enough this class of labor, either native to the United States or at its threshold, is not as well understood by the iron and steel manufacturer of the North as is European labor. It is realized that this understanding involves a social study as to the characteristics of the negro and the Mexican and that before such labor can be brought up to the highest point of efficiency this understanding is necessary. Belief is expressed that these sources will prove to be progressively more important as sources of labor supply to it as time goes on and yet there are those who are inclined to think that both the negro and the Mexican will, unless understood and made satisfied in employment in the North, drift back to the South and Southwest.

There has been a great deal of talk, but so far it has never gone beyond that stage, of ironing out the cycle of employment in the coal industry so that the number of employes engaged can be reduced and the surplus placed in the iron and steel and other industries. The iron and steel industry, also, of course, is constantly increasing mechanical efficiency and changing methods of compensation. These exertions on the part of the iron and steel industry manifestly have been due in large part at least to an anticipation that immigration laws not only will not be relaxed but will be tightened.

*Reprinted from "Iron Age," August 9, 1923.

Questions and Answers

Edmund Shaw, Consulting Engineer, Chicago, Ill., Expert on Problems of Screening, Washing and Hydraulic Separation — THE TECHNICAL STAFF OF ROCK PRODUCTS — Edwin Brooker, Washington, D. C., Consulting Expert on Matters of Transportation and Freight Rates

What Is Lime?

Cyrus Field Willard, with the request that he be permitted to "contribute a little to the gaiety of nations," writes as follows to this department:

What Is Lime? In your department, Questions and Anwers, where you answer a querist in the matter of the use of the term "agricultural lime," you take up a matter which is not settled, for no matter is ever settled unless it is settled right.

The word "lime," according to my unabridged, comes from the Anglo-Saxon "lim," German "leim," Old High German "lim," also in Icelandic and Swedish "lim," while in Danish it is "liim," from the Latin "limus" meaning "mud." The first definition of lime given in the dictionary is "birdlime."

Its secondary meaning only is that of oxide of calcium, which is a derived meaning and due to its making when mixed with water and becoming slacked lime, a "limus" or mud, but, in doing so, it ceases to be a calcium oxide.

The verb "to lime," which comes from the Anglo-Saxon "geliman," meaning "to glue or join together," is from "lime, a viscous substance," so the dictionary says, and means "to smear with a viscous substance" or "to cement," as Shakespeare says, "Who gave his blood to lime the stones together."

This attempt to limit the broad meaning of "limus" to calcium oxide is most illogical since it does not become a "limus" or mud until it ceases to be calcium oxide and becomes calcium or lime hydrate—$Ca(OH)_2$. Whatever lime may be, it certainly is not what it is not. Since our discovery, which will permit any one when they know how to make a "limus or mud" of calcium carbonate, such an attempt is still more illogical.

Then to still further complicate matters for those who would be so illogical, we find the unabridged defines "calcite" as from the Latin "calx, calcis, *lime*," and as being "a calcium carbonate or carbonate of *lime*." Then when we seek the definition of "calcium" we find it, too, comes from Latin "calx, calcis, *lime*." We find the word "calx" still in the dictionary, which says that it, too, is from the Latin "calx, calcis, *limestone*," while we find the word "calcine" from the French "calciner" (from the Latin, "calx, calcis, *lime*"), meaning "to reduce to a powder or friable state by the action of heat." Thus when we calcine calcium carbonate or calcite, we do not make lime, but reduce it to a powder or friable state which becomes lime only when we mix it with water.

Then the dictionary says that "chalk" is from the Anglo-Saxon "cealc, lime," which in turn came from the Latin "calx, *limestone*," and is defined "a soft, earthy substance of the same composition as calcium carbonate or ordinary limestone."

To sum up the whole case, the strict meaning of our English word "lime" is a sticky, viscous "mud" (the plasterers often call it that), from the Latin "limus" which, of course, calcium hydroxide does make with water, while chalk, calcium and calcite all come from the Latin "calx" which, according to the dictionary, means "lime." Lime is certainly not calicum oxide, although that is the one substance to which the effort is being made to confine it, for it does not make a "limus" until mixed with water, when it ceases to be calcium oxide, and then when the mud is applied to the wall as plaster, it takes up CO_2 from the air and becomes calcium carbonate.

"Lime" therefore is any form of calcium or calcite which will make a "limus" or "mud" with water, and hence calcium carbonate treated by my process and mixed with water, making a mud thereby, is more truly "lime" than calcium oxide, which does not make a "lime" until it ceases to be calcium oxide.

No. 77. **Power to Operate a Dredge Pump**—I am told that it requires less power for a dredge pump when it is pumping sand than when it is pumping water. I do not see how this can be true. If it is true, what is the reason?—C. G. Y.

A. The statement is, generally speaking, true. A measure of the power used shows that the pump requires less power when it stops pumping water and begins to pump sand. The explanation is that the volume pumped is lessened when the pump begins to pump sand, and the power used in pumping is more or less proportional to the volume pumped, regardless of whether the pump is pumping sand and water or only water. A pressure gage on the pipe line will show that the pump is working against a higher head when it is pumping sand and water than when it is pumping water only, but the volume is so much reduced that the work done is really less.—E. S.

No. 78. **How Sand-Lime Brick Is Made**—We are seeking information regarding the manufacture of sand-lime brick. Could you tell us what grade of sand is used in the process and where it can be obtained?—C. E. P.

A. There are only two raw materials entering into the manufacture of sand-lime brick—sand and lime, the former constituting from 85 to 95 per cent of the weight of the brick. A brick generally weighs about 5 lb., so at least two tons of sand are required for every thousand brick made. The sand used varies, but, ordinarily, the common form of silica or quartz sand is suitable. Sand has two distinct functions to perform in the manufacture of sand-lime brick: Part of it must enter into chemical combination with the lime to form the calcium-silicate bonding material. The rest of the sand grains constitute the aggregate which is bound together and which forms the main body of the brick. The sand selected for the making of sand-lime brick should be free from such impurities as mica, feldspar, and clay. Mica is not very objectionable, as it is more or less of an inert filler, while feldspar is decomposed in the curing process, causing the production of soluble alkali salts which leach to the surface of the brick and cause efflorescence. Clay merely tends to weaken a brick, although up to proportions of 10 or 12 per cent it is not particularly injurious. A sand with a sharp, regular grain is preferred, and the projections give opportunity for more secure fastening of the bonding material. However, this factor is hardly of sufficient importance to merit serious consideration. The important consideration is a correct proportion of different sized grains.—C. A. B.

No. 79. **What Does Hydraulic Head Mean?**—In reading about centrifugal pumps, I find references to a "hydraulic head." Just what does this term mean?—J. A. T.

A. The hydraulic head is the head required to keep the water flowing through the pipe. It is possible to have a pump run just fast enough to hold the water at the end of the pipe (if it is vertical) without discharging. In order to keep a stream flowing through the pipe, there must be a head in addition to that which is required to overcome the height through which the water is raised and the friction of flowing through the pipe, and this additional head is called the hydraulic head. It may be figured from the velocity of the stream in the pipe.—E. S.

No. 80. **Cheapest Bin?**—What do you consider the cheapest type of bin for a sand and gravel plant?—C. G. F.

A. The answer to such a question depends on the locality in which the bin is to be erected, and also the service to which it is to be put. So far as first cost goes, the circular steel tank is probably the cheapest bin that can be built in your locality.—E. S.

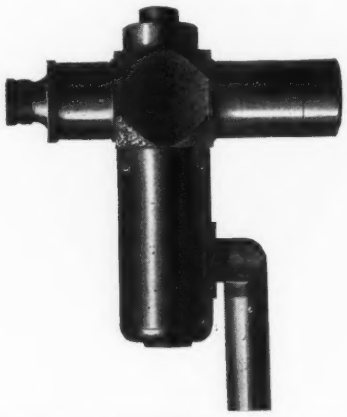
A New Radiation Pyrometer*

Portable Instrument for the Measurement of High Temperatures and Suitable for Lime and Cement Kilns

By D. Flir

As all thermoelements must be protected at high temperatures against the chemical influence of their surrounding mediums, and the life of the rare metal couple is in many cases unsatisfactory, while the protection tubes introduce a considerable time lag in the measurement, optical or radiation means of determining temperatures are important. A new radiation pyrometer called ardometer has been employed with much success, especially in European countries. Its name, derived from the Latin, means "heat meter." The instrument weighs one pound; it is only 5 in. high and 5 in. long.

As shown in the diagram, the ardometer consists of a telescope, with objective and ocular lens, between which is located a small thermoelement in a sealed glass bulb. The hot junction of this thermoelement is soldered to a thin, blackened platinum disk; the free ends of the couple connected to a galvanometer, either indicating or recording. In spite of its lightness this is a rugged instrument and the sensitive couple is protected against dust and dirt. The objective lens can be readily cleaned when dusty.



General view of instrument, which is 5 in. high and 5 in. long

by "Stefan-Boltzmann's" law, which states that the received thermal energy is proportional to the fourth power of the absolute temperature of the incandescent body, provided the temperature of the receiving body is low compared to that of the incandescent body. Since the galvanometer deflection will be proportional to the fourth power of the absolute temperature, also, the galvanometer will have widely separated divisions at the upper section of the scale. Though the objective lens absorbs a part of the heat rays, this is without influence on the correct reading, since the instrument is always calibrated with its lens in position. Standard scales reading up to 2200, 2600, 3000, 3300, 3700, 4000 and 4600 deg. Fahr, are available. Smaller ranges than 2200 deg. maximum are not available, because the generated emf. would be too small.

It is necessary to select carefully a range in which the maximum temperature does not greatly exceed the temperatures the instrument is to be used at, for at low temperatures the deflection of the pointer is small and the reading appears in a less favorable part of the scale where the indications are less accurate. To adjust each instrument for any range, a diaphragm is provided just behind the objective lens. All ardometers calibrated for the same range are interchangeable, because they generate the same emf. at equal temperatures. Therefore one indicator with a selective switch or a multiple recorder can be used for several instruments. One galvanometer can also be calibrated for two different ranges, for use with several ardometers.

The platinum disk and the wires of the thermocouple being very thin, the instrument has practically no heat inertia and follows each fluctuation in temperature of the glowing body instantly, giving correct reading only a few seconds after focusing.

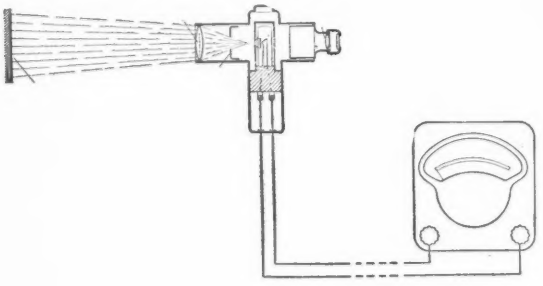
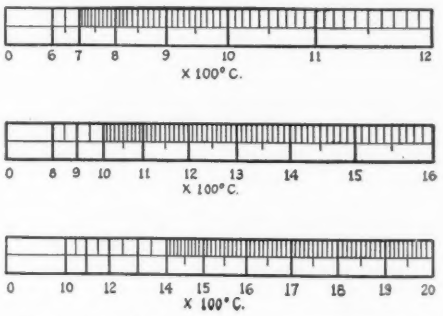


Diagram showing arrangement of parts and method of operation



Typical scales for use over varying temperature ranges

When in use, the instrument is sighted directly on the incandescent body. The total radiation of a definite area of the body is concentrated upon the blackened disk by the objective lens. In this manner the hot junction of the small couple is heated and the generated emf. (electromotive force) sends through the circuit a current which causes a deflection of the galvanometer pointer. The phenomenon is governed as in other radiation pyrometers. The generated emf. being comparatively high, enables the application of reliable galvanometers of the double pivoted type.

In operation, the radiation receiver can be permanently installed or used as a portable instrument. After being properly connected to the indicator or recorder it has only to be sighted on the glowing object so that the black platinum disk as seen through the ocular lens is perfectly covered and surrounded by radiations, as shown at *c*. The red glass accompanying

*Reprinted from *Iron Age*.

each instrument may be used to protect the eye from excessive radiation during focusing. Figs. *a* and *b* illustrate faulty focusing; in *a* the glowing area of the body being eccentric to the optical axes of the ardometer, while in *b* the area is too small at the given distance to cover the disk with radiation.

When the distance between the sighted object and the instrument is 3 ft., the glowing area must possess a diameter of at least 2.6 in., while at other distances the glowing area must be proportionately larger or smaller. The distance from the glowing body, if within proper scope of practical application, does not influence the readings, so long as the black disk is covered and surrounded by a field of light, as at *c*. This is true because, while the emitted radiation decreases as the square of the distance, the sighted area increases as the square of the distance and the two influences cancel each other. The absorbing influences of smoky and dusty intervening atmosphere would of course increase with the distance.

Either a pedestal or a tripod may be used for mounting the instrument, or it may be fixed to a shelf or other holder. It is manufactured by Siemens and Halske, Berlin, Germany, and is distributed in the United States by the Bachrach Industrial Instrument Co., Pittsburgh.

(a) *(b)* *(c)*

Illustrating proper focus (at c) and improper (at a and b)

Instrument housed in a tube protecting it from mechanical injury

Mica Deposits in the United States

IN the present "electrical age" mica supplies a need not filled by any other substance. Its nonconductivity of electricity and heat and its toughness, flexibility, and elasticity make it invaluable in the electrical manufacturing industry. Before it was so employed it was probably chiefly used in glazing, for which large sheets of mica with perfect cleavage were required. Much mica that was then regarded as waste is now used in electrical and other industries by making it into "mica board," or built-up mica.

The only commercially valuable varieties of mica mined in the United States, according to the Geological Survey, are biotite and muscovite. Biotite is a dark mineral, and its sheets are less flexible and elastic than those of muscovite. Muscovite is transparent or light-colored when split into thin sheets. Mica mined for commercial use is commonly found in rough blocks, or "books," as they are called in the Western states. The outer shell of some of these blocks is partly crushed and broken and must be removed before the blocks can be cleaved into sheets. Many of these sheets are less than 1/1000 in. thick, and some of the thin splittings prepared in India measure only about 1/6000 in.

Mica is of widespread occurrence in the United States, deposits of commercial value or of promise having been found in at least 20 states. The domestic forms of mica, muscovite and biotite, are found in pegmatite, a coarse-grained granitic rock that is by some called "giant granite." Mica-bearing pegmatite is confined to areas of crystalline rock, so that mica deposits should generally be looked for only in such areas, which are found in the eastern Appalachian region from Alabama to New York and the New England States; in northern Wisconsin, Michigan, and Minnesota, and the region including corners of Minnesota, Iowa, and part of South Dakota; in the Rocky mountain region from New Mexico to Montana; and in many smaller more or less isolated areas in nearly all the Western states from Texas to California and Washington.

These crystalline rocks were formed at least 5000 ft. below the surface, and the pegmatites, which generally consist of shoots from the granitic rocks, were also formed deep in the earth's crust. Any region in which mica-bearing rocks are found must therefore have been greatly deformed and subjected to long erosion, which carried away the 5000 or more feet of strata that overlay them and thus brought them to the surface.

A recent report issued through the Geological Survey, Bulletin 740, by Douglas B. Sterrett, entitled "Mica Deposits of the United States," contains a detailed account of the United States mica mines, and is accompanied by maps showing the location of the mines and prospects and many other illustrations.

Cooperation Helps Farmer Get Limestone

THROUGH co-operation of farmers and business men of Murray, county seat of Galloway county, Kentucky, in securing a lime shed, the farmers of the county are able to take a load of limestone home with them whenever convenient. In 1920 the lime shed fund was raised, the farmers donating one-half and the business men of the city donating the other half. The city government donated the use of an old shed for storage and after being repaired proved satisfactory for their use. The miller tends to the weighing out of the limestone and the sales are taken charge of by the Farm Bureau. In this way handling charges are reduced to the minimum. The limestone is paid for out of the shed fund and the money is returned to the fund when the limestone is sold.

Twenty carloads were handled in this manner in 1922 and so far this year six cars have been handled through this organization. —*Bulletin No. 68, National Agricultural Limestone Association.*

Quarried from Life

By Liman Sandrock

"Neighbor, I Want to Be Helpful"

THESE words, undoubtedly, furnish the key to our dead President's character, his generous and unselfish outpouring of service and the application at all times of "good will to his tremendous tasks."

Said his close friend, Secretary Hoover: "The Almighty has taken the President from his work. There is loss to the Nation of a great leader and to many thousands a beloved personal friend. At my first meeting with him his greeting was, 'Neighbor, I want to be helpful.' Being helpful to his neighbors was Warren Harding's ideal. He envisaged the whole American people as homefolks and neighbors.

"He came to the presidency in a time of high national emotion, of bitter prejudice, of deep conflict in thought, of unparalleled dislocation of economic life. It was his determination to soften anger and to secure progress and healing through helpfulness.

"He felt that hard driving would open unhealable breaches among our people. He applied geniality and good will to his tremendous tasks in a way that amounted to genius. But underneath was resolute moral courage and steadfastness. He was the man needed for our times."

Randolph Snoddy of the Coon River

WHEN we know it's the proud boast of a brother that he's been a member of his association since its inception—we know him for the regular he-man he really is.

Randolph Snoddy, manager of the Coon River Sand Co., is the brother we have in mind as the chief personage in this veracious chronicle. We have sat under his wisdom at conventions, chummed with him in those delightful moments of relaxation that always have their being during convention time, and we are main proud to call him our friend, as are all who enjoy his friendship.

Randolph Snoddy has had an interesting career, as have many of the men who have built up the rock products industry. He was born in Smith county, eastern Tennessee, on October 4, 1876. At a school in the mountains he attained the sixth grade—and then up and quit.

He was only about 12 years old at that time and, boylike, he doubtless yearned to find out what was beyond those mountains that shut from his vision a sight of the wide world. So he got himself a job as a traveling salesman for a wholesale grocery house. There are mighty few traveling salesmen who can boast that they were in the sales game at the age of 12—in fact, he was one of the youngest commercial travelers in the world.

But even groceries are not all-appealing and our youthful salesman forsook them for other fields. He worked on railroad construction, in power plants and sawmills, the stockyards and the like, all the while gathering an experience that stood him in good stead later. Then—you'd never believe it!—he got into the patent

Randolph Snoddy

medicine business. That business in those days was not what it is today, not on your hostetter's bitters—it had a zip and a kick that would now come under the Eighteenth Amendment, if our memory serves us correctly.

Well, what Randolph Snoddy got out of this job was the title of "Doc" and a chance to get into the thriving burg of Des Moines, Iowa. And this was good getting as you will see as we progress with this tale.

Along about 1907 F. M. Hubber, a Des Moines capitalist, wanted to start a business for one of his sons. As the sand and gravel production looked pretty good to Mr. Hubber he built a plant and began operating. As such production requires experience as well as money the young company lost 7500 perfectly good dollars the first year.

Nothing singular about that, but it gave pause to the man with the money invested. To show how old man Opportunity manages to amble in at the right time, our friend the Doc was located in his patent medicine business directly across the street from the Hubber plant. Casually, he overheard a conversation in which Mr. Hubber stated that he would give a man an interest in the business and a good salary if that man could put the plant on a paying basis.

Mr. Snoddy took Opportunity by the horns, as it were; went in to Mr. Hubber and closed the deal, and fixed his first year's salary at $1000.

Demonstrating his fitness for this new enterprise, he showed a total profit at the end of the year of $8000! Well, to make a long story no longer, our friend has been with the company ever since. Furthermore, he is one of the pioneer sand and gravel men in Iowa. As a matter of fact, there was but one other man in this business when he went in. A few years later there were seven men who had taken a chance and won out. Today in the vicinity of Des Moines there are 13 sand and gravel producers.

It is stating it conservatively to say that the Coon River Sand Co. does 75 per cent of the total retail business in Des Moines. It was Mr. Snoddy's ingenuity and his experience which made for his success as a producer and the industry has many times given him deserved credit for his many original ideas. He knows his line and hews to it without making any extra chips.

It's interesting to journey the course of this gentleman who was graduated from Peruna College—meaning it as a pure figment of speech—and found his vocation in a business that has put Coon river deeper on the Iowa map and established an enviable reputation in the industry for the Coon River Sand Co.

They Said It

JOHN C. EDEN, president of the Superior Portland Cement Co., Seattle, Wash., recently returned from an European trip. "The best thing one can buy in Europe is a ticket home. They have no concrete roads in the British Isles or in Southern Europe." When Mrs. Eden would remark upon the beautiful scenery, friend husband's reply would be: "Yes, but think of Chuckanut Drive at home!"

OUR ALAN SANGER tells us that Bangor, Pa., surely patronizes home trade. He saw only one wooden-shingle house in that town; all the others employed slate. This is an example for Cementville, Sandbricktown, Plaster City and Gypsuma to roll their own!

Editorial Comment

The Freight Rate Fight

The Interstate Commerce Commission has acted with unprecedented and unexpected expedition on the petition of the National Sand and Gravel Association for a rehearing of its Central States rate case. The petition was presented on June 27, as noted on page 31 of ROCK PRODUCTS of July 28; and on July 31, before taking their summer vacations, the commission "knocked it for a home run," without very much formality. The matter is now finally settled so far as a national rate case is concerned, but it is to be hoped that it is not settled so far as the pursuit of objective is affected.

If the arguments of sand and gravel producers are sound, and their statistics accurate—and we believe both are so—producers have an excellent opportunity to make them prevail with railway officials; not, however, in their entirety, but in such individual cases as the circumstances and the facts will make an appeal to the business sense of the railway managers. Many cases have already been handled in this way.

It would be a waste of time and effort to moralize on relative accomplishments in pursuing these two different courses. It is doubtful, however, if individuals in the sand and gravel industry have lost any good will of the railroads for fighting them; and however futile the fight may now seem, let it not be forgotten that it was the direct cause of bringing many men in the industry together under a common banner and under fighting leaders, who have done much to impress sand and gravel producers, as well as the public, with the commercial importance of a commonly despised commodity.

ORDER

At a General Session of the INTERSTATE COMMERCE COMMISSION, held at its office in Washington, D. C., on the 31st day of July, A. D. 1923.

No. 13231

National Association of Sand and Gravel Producers

v.

Pennsylvania Railroad Company et al.

Upon further consideration of the record in this proceeding and of the petition of the complainant for rehearing:

IT IS ORDERED, That the said petition be, and it is hereby, denied.

By the Commission:

GEORGE B. McGINTY,
(SEAL) Secretary.

The Elimination of Waste

The last sentence in the concluding article of Arthur E. Truesdell's notable series on lime kilns, on page 25 of the July 28 issue, says "that most vital problem of our industry — The Elimination of Waste." Vital it is, as lime manufacturers are just beginning to appreciate. But there is no need for them any longer carrying the distinction of great wasters — inefficient operators in the last analysis—because there are well-known means of preventing a large part of present wastes. Mr. Truesdell has pointed out many; and Victor J. Azbe, in his admirable paper before the recent convention of the National Lime Association, printed elsewhere in this issue, has pointed out other ways.

Promoting Cement Plants

Cement-manufacturing projects are apparently becoming very popular with promoters. Limestone and clay or shale are quite widely distributed in this country, and it is assumed options on such properties at a little better than farm values are not difficult to secure. But there is quite a step between a limestone quarry and a clay bank and a successful portland cement factory.

We are "bullish" on the future of portland cement. We believe that it is going to be used more and more and for things as yet undreamed of. We believe that the increase in its consumption from 230,000 bbl. in 1880 a year to 110,000,000 bbl. or so in 1922 will continue at the same or greater rate for some time yet; and we know there are some sections of the country where the per capita consumption as compared with other states makes them look like particularly fertile fields for new factories.

Despite of all this we would not put our money into a cement-manufacturing project, or advise any one else to do so, until a systematic and comprehensive survey of the market territory had been made by outside experts whose sole business it is to make such surveys.

We would analyze pretty thoroughly the alleged scarcity of portland cement, bearing in mind that present mills are capable of producing 140,000,000 bbl. a year as soon as projected plans for distributing construction work over a longer season are more widely adopted —and that new mills capable of producing about 20,000,000 bbl. more are nearing completion. A little time might be spent finding out whether work that is alleged to be held up for lack of cement would not be held up anyway for lack of labor or some other cause.

We haven't forgotten that experienced portland cement manufacturers went through a long period of overproduction, cut-throat competition and receiverships before they learned to make alleged present profits.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	**1.25**	**1.10**	**1.10**	**1.10**	.....
Buffalo, N. Y.			1.30 per net ton all sizes			
Chaumont, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	**1.25**	**1.25**	**1.25**	**1.25**	.....
Coldwater, N. Y.			1.50 per net ton all sizes			
Eastern Pennsylvania	1.35	1.35	1.45	1.35	1.35	1.35
Munns, N. Y.	1.00	1.40	1.40	1.30	1.30	.....
Prospect, N. Y.	.80	1.40	1.40	1.30	1.30	.....
Walford, Pa.	1.55	**1.55**	**1.55**	**1.55**	**1.55**	**1.55**
Watertown, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.50@2.00	.....	1.50	.....	.....	.....
Buffalo, Iowa	.70	.....	1.35	1.15	1.20	1.20
Bloomville, Middlepoint, Dunkirk, Bellevue, Ohio	1.00	1.10	1.10	1.00	1.00	1.00
Chasco, Ill.	1.30	1.25	1.25	1.25	1.20	.....
Chicago, Ill.	.80	1.50	1.10	1.10	1.10	1.10
Dundas, Ont.	.95	1.35	1.35	1.35	1.10	1.10
Greencastle, Ind.	1.25	1.15	1.05	1.05	.95	.95
Krause, Columbia and Valmeyer, Ill.	1.20	1.20	1.35	1.35	1.20	1.20
Lannon, Wis.	.80	1.10	1.10	1.00	1.00	.90
Mitchell, Ind.	1.00	1.00	1.00	1.00	1.00	1.00
Montreal, Canada	.90	1.20	1.10	1.00	.95	.95
Montrose, Iowa	.....	1.50	1.60	1.55	1.45	1.40
Sheboygan, Wis.	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10
Southern Illinois	1.35	1.30	1.30	1.30	1.25	.....
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.35	1.35	1.35	1.35
Stone City, Ia.	.75	.....	1.50	1.40	1.30	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.00	2.00	2.00
			Prices include 90c freight			
Waukesha, Wis.	1.00	1.00	1.00	1.00	1.00	1.00
SOUTHERN:						
Alderson, W. Va.	**.75**	**1.25**	**1.40**	**1.25**	**1.15**	.....
Bridgeport, Texas	1.10	1.40	1.35	1.35	1.25	1.25
Bromide, Okla.	**.75**	**2.00**	**1.75**	**1.60**	**1.50**	**1.25**
Cartersville, Ga.	1.25	1.60	1.60	1.00	1.20	1.15
Chickamauga, Tenn.	1.00	1.00@1.25	.....	1.00@1.25	1.00@1.25	.....
El Paso, Texas	1.00	1.00	1.00	1.00	.....	.....
Ft. Springs, W. Va.	.80	1.60	1.60	1.50	1.40	.....
Garnet and Tulsa, Okla.	**.50**	**1.60**	**1.60**	**1.45**	**1.45**	.....
Ladds, Ga.	.....	.....	**1.40**	**1.40**	**1.40**	.....
Morris Spur (near Ft. Worth), Tex.	1.10	1.35	1.30	1.25	1.25	1.20
WESTERN:						
Atchison, Kans.	.50	2.00	2.00	2.00	2.00	1.90
Blue Spr'gs and Wymore, Neb.	.20	1.50	1.50	1.40	1.30	1.25
Cape Girardeau, Mo.	**1.35**	.....	**1.10**	**1.35**	**1.10**	.....
Kansas City, Mo.	1.00	**1.50**	1.50	1.50	1.50	1.50

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.50	1.35	1.15	1.00	.....
Bound Brook, N. J.	1.70	2.10	1.80	1.50	1.40	.....
Dresser Jct., Wis.	1.00	2.25	.....	1.75	2.00	.....
Duluth, Minn.	1.00	2.25	2.00	1.50	1.40	.....
E. Summit, N. J.	1.80	2.30	1.90	1.60	1.40	.....
Eastern Massachusetts	.85	1.75	1.75	1.40	1.40	1.40
Eastern New York	.75	1.50	1.50	1.30	1.40	1.30
Eastern Pennsylvania	1.25	1.55	1.50	1.40	1.40	1.40
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.50@2.00	1.35@1.50	1.15@1.25	1.00@1.10	.....
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	.....
Richmond, Calif.	.50*	.....	1.50*	1.50*	1.50*	.....
San Diego, Calif.	1.80	1.80	1.50@1.80	1.25@1.55	1.25@1.55	1.10@1.35
Spring Valley, Calif.	.70	1.55	1.50	1.40	1.35	1.35
Springfield, N. J.	1.80	2.30	1.90	1.60	1.40	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Atlanta, Ga.—Granite	**1.47**	**2.07**	**2.07**	**1.97**	**1.97**	.....
Buffalo, N. Y.—Granite	.90	.....	1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.60	1.70	1.60	1.50	1.40	.....
Columbia, S. C.—Granite	.50	2.25	2.25	2.00	2.00	2.00
Eastern Penna.—Sandstone	.85	1.60	1.55	1.35	1.35	1.30
Eastern Penna.—Quartzite	1.20	1.35	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	.75	1.75	1.75	1.25	1.25	.....
Lohrville, Wis.—Cr. Granite	**1.35**	**1.40**	**1.30**	.....	**1.20**	.....
Middlebrook, Mo.—Granite	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@1.50
Sioux Falls, S. D.—Granite	1.00	**1.60**	**1.55**	.....	**1.50**	.....

*Cubic yard. †Agrl. lime. ||R.R. ballast. §Flux. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone

(Pulverized)

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk	2.50
Grove City, Pa. — Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$; 60% thru 100 mesh; 45% thru 200 mesh; 100% thru 20 mesh; sacks, 5.00	3.50
Hillsville, Pa.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; sacks, 5.00; bulk	3.50
Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk	2.50
New Castle, Pa.—96% $CaCO_3$ 1.40% $MgCO_3$—75% thru 100 mesh, 94% thru 50 mesh; sacks, 5.00; bulk	3.50
Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk	3.00
Watertown, N. Y. — Analysis, 96% **$CaCO_3$; .02% $MgCO_3$; 90% thru** 100 mesh; bulk, 3.00; sacks	4.50
West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$ — 50% thru 100 mesh; paper bags, 4.75—cloth, 5.25; bulk	3.25
Alton, Ill. — Analysis, 98% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 100 mesh	6.00
Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk	2.50
Chasco, Ill.—Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$; 90% thru 100 mesh..	5.00
90% thru 50 mesh	1.35
Detroit, Mich.—**Analysis, 88% $CaCO_3$,** 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh	1.80@3.80
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 80-lb p. sacks 5.00; bulk	3.50
Piqua, Ohio—100% thru 10 mesh, 2.10; 50% thru 100 mesh, 2.25; 80% thru 100 mesh, 5.00; 100% thru 100 mesh; bags 7.00; bulk	5.50
Waukesha, Wis.—Analysis, neutralizing equivalent 107.38% $CaCO_3$; 99% thru 10 mesh, 55% thru 60 mesh; bulk	2.35
200-mesh bags ex., returnable	4.50
Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 10% thru 10 mesh	1.50
Hot Springs, N. C.—50% thru 100 mesh; sacks, 4.25; bulk	2.70
Knoxville, Tenn.—80% thru 100 mesh, bulk (bags 1.25 extra)	2.70
Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; bulk	2.75
Mountville, Va. — Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 100% thru 20 mesh; sacks	5.00
Colton Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk	4.00
Lemon Cove, Calif.—Analysis, 94.8% $CaCO_3$, 0.42% $MgCO_3$; 60% thru 200 mesh; sacks, 5.25; bulk	4.50

Agricultural Limestone

(Crushed)

Alton, Ill. — Analysis, 98% $CaCO_3$, 0.1% $MgCO_3$; 90% thru 50 mesh	1.50
Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh	1.25
Bettendorf, Iowa, and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Buffalo, Iowa—90% thru 4 mesh	1.00
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 100% thru 10 mesh, 90% thru 50 mesh	1.50
90% thru 4 mesh, cu. yd	1.35
Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$; 90% thru 4 mesh	.80
Columbia, Ill., near East St. Louis—½-in. down	1.25@ 1.80
Elmhurst, Ill.—Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$; 50% thru 50 mesh	1.25
Huntington and Bluffton, Ind.—Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; about 20% thru 100 mesh	1.25

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Agricultural Limestone

(Continued from preceding page)

Greencastle, Indiana.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh..... 2.00
Kansas City, Mo.—50% thru 100 mesh 1.50
Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh..... 1.20
Ladds, Ga.—Analysis, 61% $CaCO_3$, 35% $MgCO_3$—all passing 10 mesh 1.50@ 1.75
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh..... 2.00
Screenings (¼ in. to dust)..... 1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 100% thru 4 mesh; 83% thru 10 mesh; bulk 1.25
Milltown, Indiana.—Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$; 35% thru 50 mesh..... 1.40@ 1.65
Mitchell, Ind.—Analysis, 97% $CaCO_3$, 1% $MgCO_3$; 50% thru 100 mesh, 90% thru 4 mesh..... 1.25
Montrose, Iowa.—90% thru 100 mesh. 1.25
Narlo, Ohio.—Analysis, 56% $CaCO_3$ 43% $MgCO_3$; limestone screenings, 37% thru 100 mesh, 55% thru 50 mesh, 100% thru 4 mesh..... 1.50@ 2.00
Ohio (different points), 20% thru 100 mesh, bulk..... 1.25@ 1.50
Piqua, Ohio—100% thru 4 mesh..... 1.25
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk..... .80@ 1.40
Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ¼-in. mesh..... 1.30
Stone City, Iowa.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh..... .75
Toledo, Ohio.—¼ in. to dust, 30% thru 100 mesh 1.50
Waukesha, Wis.—No. 1 kiln dried..... 2.00
No. 2 Natural..... 1.75
Alderson, W. Va.—Analysis, 90¾ $CaCO_3$; 90% thru 50 mesh..... 1.75
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 90% thru 50 mesh 1.50
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$; 90% thru 50 mesh..... 3.00
50% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh..... 2.75
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh..... 1.50
Ladds, Ga.—50% thru 50 mesh..... 2.00
Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCO_3$; 50% thru 50 mesh..... .50
Kansas City, Mo., Corrigan Siding—50% thru 100 mesh; bulk..... 1.80
Tulsa, Okla.—90% thru 4 mesh..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

Glass Sand:

Berkeley Springs, W. Va..... 2.25@ 2.50
Cedarville and South Vineland, N. J.—Damp, 1.75; dry..... 2.25
Cheshire, Mass.—24 mesh, 5.00; 40 mesh, 6.00; 100 mesh..... 7.00
Columbus, Ohio ..... 1.50@ 2.00
Dunbar, Pa.—Damp 2.50
Falls Creek, Pa..... 2.25
Hancock, Md.—Damp, 1.50; dry..... 2.00
Klondike and Pacific, Mo..... 2.00@ 2.50
Mapleton, Pa. ..... 2.25@ 2.50
Mapleton Depot, Pa.—Damp, 2.00 dry 2.75
Massillon, Ohio 3.00
Michigan City, Ind..... .50
Millville, N. J. (green)..... 2.00
Mineral Ridge, Ohio..... 2.50@ 3.00
Montoursville, Pa. 2.00
Oregon, Ill. 2.50
Ottawa, Ill. 1.50
Pittsburgh, Pa.—Dry, 4.00; damp..... 3.00
Rockwood, Mich. ..... 2.50@ 2.75
Round Top, Md..... 2.25
Sands, Pa. 2.50
San Francisco, Calif..... 3.00@ 3.50
St. Louis, Mo. ..... 2.50@ 3.00
Thayers, Pa. ..... 2.25@ 2.50
Utica, Ill. 1.50
Zanesville, Ohio ..... 2.00@ 2.50

Foundry Sand:

Albany, N. Y.—Molding fine 2.25
Molding coarse 2.00
Sand blast (kiln dried)..... 4.50
Brass molding 2.25
Allentown, Pa.—Core and molding fine 1.75@ 2.00
Arenzville, Ill.—Molding fine..... 1.50@ 1.75
Brass molding 1.75
Beach City, Ohio.—Core, washed and screened ..... 2.00@ 2.50
Furnace lining ..... 2.50@ 3.00
Molding fine and coarse..... 2.25@ 2.50
Cheshire, Mass.—Furnace lining, molding fine and coarse..... 5.00
Sand blast ..... 5.00@ 8.00
Stone sawing 6.00
Cleveland, Ohio.—Molding coarse..... 1.50@ 2.00
Brass molding ..... 1.50@ 2.00
Molding fine ..... 1.50@ 2.25
Core ..... 1.25@ 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, f.o.b., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Attica, N. Y.	.75	.75	.75	.75	.75	.75
Ambridge and So. Heights, Pa.	1.25	1.25	1.25	.85	.85	.85
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.		.90		1.00	1.25	
Farmingdale, N. J.	.48	.48	.75		1.10	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.50	1.75		1.35	1.25
Machias, N. Y.	.75	.75	.85	.85	.85	.85
Pittsburgh, Pa.	1.25	1.25	1.25	.85	.85	.85
Portland, Me.		.50	1.75		1.35	1.35
Washington, D. C. (Rewashed, river)	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50	.40				.90
Barton, Wis.		.40@ .60		.50@ .70	.50@ .70	
Beloit, Wis.		.70			.80	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00
Des Moines, Iowa	.50	.50	1.25	1.60	1.60	1.60
			Unwashed ballast, .50 ton			
Dresden, Ohio	.70	.60	.60		.90	
Earlestead (Flint), Mich.	.70					
Eau Claire, Wis.	.40@ .45	.40	.85@1.15			.85
Elkhart Lake, Wis.	.70	.60	.76	.80	.70	.70
Ft. Dodge, Iowa		1.22		2.17		
Grand Rapids, Mich.		.50		.80		.70
Hamilton, Ohio	1.00	1.00	1.00		1.00	
Hawarden, Iowa	.60	.50			1.60	
Hersey, Mich.		.50			.75	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Iowa	.65	.60	1.70	1.75	1.65	1.65
Mankato, Minn. (pit run)	.35@ .50	.35@ .50	1.25@1.35	1.25@1.35	1.25@1.35	1.25@1.35
Milwaukee, Wis.	1.11	1.11	1.36	1.36	1.36	1.36
Minneapolis, Minn.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Moline, Ill.	.60	.60	1.20	1.20	1.20	1.20
Riton, Wis.		.40			.60	
St. Louis, Mo., f.o.b. cars	1.20	1.45	1.65	1.45		
St. Louis, Mo., deliv. on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.65@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Terre Haute, Ind.	.75	.75	.75	.90	.90	.90
Waukesha, Wis.	.50	.50	.80	.80	.80	.80
Winona, Minn.	.40	.40	1.25	1.10	1.10	
			(.05 ton discount 10 days)			
SOUTHERN:						
Atlanta, Ga.	1.24	1.24	2.79	1.90	1.90	1.90
Birmingham, Ala.	1.29	1.29	2.79	1.79	1.64	1.54
Charleston, W. Va.	all sand 1.40		all gravel 1.50			
Estill Springs, Tenn.	1.35	1.35		1.00	.85	.65
Ft. Worth, Texas		1.50	1.50	1.50	1.50	1.50
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75@1.00	.75@1.00	1.20	1.20	1.20	1.20
Lake Weir, Fla.		.60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.00	1.00	1.80	1.80	1.80	1.80
N. Martinsville, W. Va.	1.00				1.20	.80
New Orleans, La.	.25	1.35				
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw river sand, car lots, .75 per ton; Missouri river, .85)					
Los Angeles, Calif.		.70	1.20	1.20	1.10	1.10
Pueblo, Colo.	1.10*	.90*		1.50*		
San Diego, Calif.†	.50@ .70	.80@1.00	1.30@1.60	1.35@1.65	1.10@1.40	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.25*	1.25*	1.50*	1.25*		1.25*
Spring Valley, Calif.	.70	.80	1.40	1.35	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine sand, 1/10 in.	Sand, ¼ in.	Gravel, ½ in.	Gravel, 1 in.	Gravel, 1½ in.	Gravel, 2 in.
Atlanta, Ga.	.30@ .40	.30@ .40				
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, .80 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dresden, Ohio		.60				
Dudley, Ky. (crushed sand)	1.00	1.00		.90		
East Hartford, Conn.			.65 per cu. yd.			
Elkhart Lake, Wis.	.70	.50			.60	.60
Estill Springs, Tenn.						.85
Fishers, N. Y.		.60			.55@ .60	
Grand Rapids, Mich.						.50
Hamilton, Ohio					.70	
Hartford, Conn.		1.00*				
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Texas			.55	.55	.55	
Janesville, Wis.		.65			.65@ .75	
Mankato, Minn.			All sand and gravel .60 per ton			
Montezuma, Ind.			Road gravel .50 per ton			
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.	.25					
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			About 60% gravel, 40% sand, 1.55			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Texas		.80		1.50		1.30
Winona, Minn.	.40	.40	.60	.60		
York, Pa.		1.00@1.20	(crushed rock sand)			

* Cubic yard. B Bank. L Lake. || Ballast. † Low prices, wholesale; high prices, retail.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y.	2.25@2.35	1.25@1.35	1.25@1.35	1.25@1.35	1.25@1.35	1.25@1.35	1.25@1.35
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.15	1.15
Eastern Penn. and Northern N. J.	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Erie, Pa.	Crushed run slag, 4 in. and less, 1.25@1.35						
Emporium, Pa.			1.35	1.35	1.35	1.35	1.35
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Penn.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.	All sizes, 1.50, f.o.b. Chicago						
Detroit, Mich.	All sizes, 1.65, f.o.b. Detroit						
Ironton, O.	2.05	1.45	1.75	1.45	1.45	1.45	1.45
Jackson, O.		1.35		1.35	1.35	1.35	1.35
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
Steubenville, Lowellville, Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton and Low Moor, Roanoke, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Adams, Mass.			7.00				2.90	
Bellefonte, Pa.		10.50§	10.50§	10.50§	9.00		8.50	1.80
Buffalo, N. Y.				12.50				
Berkeley, R. I.			12.00					2.30
Cassadaga, N. Y.			Agricultural marl 7.00					
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.00	
West Rutland, Vt.	13.50	12.00					11.00	3.20
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		11.50	11.50	12.50				1.85
Zylonite, Mass.	3.20d	2.90d	7.00					
CENTRAL:								
Cold Springs, Ohio		11.00	10.50		9.00	11.00	10.00	
Delaware, Ohio		11.00	9.50	11.50			10.00	1.60
Gibsonburg, Ohio	12.50		10.50		9.00	11.00	10.00	
Huntington, Ind.	12.50	11.00	10.00		9.00		10.00	1.60
Luckey, Ohio	12.50a	11.00	10.00a		9.00			
Marblehead, Ohio		11.00	10.00				10.00	1.60
Marion, Ohio		11.00	10.00				10.00	1.80
Mitchell, Ind.				12.00	11.00		10.00	1.60
Sheboygan, Wis.							10.00	
White Rock, Ohio	12.50				9.00	11.00		
Woodville, O. (dlrs.' price)	12.50a	11.00a	10.00a		9.00		10.00	1.60
SOUTHERN:								
Erin, Tenn.							9.00	1.50
El Paso, Texas							9.00	1.50
Karo, Va.							7.00	1.50
Knoxville, Tenn.	12.50	11.00	11.00	11.00	9.00		9.00	1.50
Ocala and Zuber, Fla.	14.00	14.00		14.00				1.75
Sherwood, Tenn.	12.50	11.00	11.00	11.00			8.50	1.50
Staunton, Va.					4.50	5.50	8.50	1.35
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. M.							12.50	
San Francisco, Calif.	21.50	21.50	15.00	21.50			18.50	2.40
Tehachapi, Calif.							13.00	2.15

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §paper sacks. (a) 50-lb. paper bags; terms, 30 days net, 25c per ton or 5c per barrel discount for cash in 10 days from date of invoice; (b) burlap bags; (c) 200-lb. barrels; (d) 280-lb. barrels net.

Miscellaneous Sands

(Continued from preceding page)

Columbus, Ohio.—Core	.50@ 2.00
Sand blast	4.50@ 5.50
Molding fine	2.75@ 3.00
Brass molding	2.50
Furnace lining	1.50@ 2.00
Sand blast	3.50@ 5.00
Molding coarse	1.50@ 2.00
Stone sawing	1.50@ 3.50
Traction	.50@ .90
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dunbar, Pa.—Traction, damp	2.50
Dundee, Ohio.—Glass, core, sand blast traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Eau Claire, Wis.—Core	1.00@ 1.25
Sand blast	3.25@ 3.75
Falls Creek, Pa.—Molding, fine and coarse	1.75
Sand blast	2.00
Traction	1.75
Franklin, Pa.—Core	2.00
Furnace lining	2.50
Molding fine and coarse	2.00
Brass molding	2.00
Greenville, Ill.—Molding coarse	1.30@ 1.60
Joliet, Ill.—No. 2 molding sand and loam for luting purposes; milled	.80
Bank run	.65
Kansas City, Mo.—Missouri river core	.80
Kasota, Minn.—Molding fine	1.60@ 1.85
Molding coarse, stone sawing	1.45@ 1.75
Klondike, Pacific, Gray Summit, Mo.—Molding fine and coarse, stone sawing, roofing sand	2.00
Mapleton Depot, Pa.—Traction	2.00
Molding fine, damp	2.00
Mapleton, Pa.—Glass, core, furnace lining, molding fine and coarse; damp, 2.00; dry	2.75
Massillon, Ohio—Molding fine and coarse, furnace lining, core	3.00
Traction	2.75
Michigan City, Ind.—Core, traction	.50
Mineral Ridge, Ohio.—Core, furnace lining, molding fine and coarse, roofing sand, sand blast, stone sawing, traction, brass molding (green)	2.25
Montoursville, Pa.—Core	1.25@ 1.40
Traction	1.00@1.25
New Lexington, Ohio—Molding fine	2.25
Molding coarse	2.00
Oregon, Ill.—Core	1.50@ 2.00
Sand blast	4.00
Stone sawing	2.00@ 2.50
Ottawa, Ill.—Core	1.50@ 2.00
Furnace lining and traction	1.50
Roofing sand	1.75
Sand blast	4.50
Stone sawing	3.00
Brass molding	2.50
Molding, coarse (crude)	.85@ 1.00
Ottawa, Minn.—All crude silica sand	.75@ 1.00

Miscellaneous Sands

(Continued)

Rockwood, Mich.—Core	.90@ 2.50
Roofing	2.75
Sand blast	3.75
Round Top, Md.—Core (damp)	1.60
Traction (damp)	1.75
Roofing sand	2.25
San Francisco, Calif. (washed and dried)—Core, molding fine, roofing sand and brass molding	2.00@ 3.50
(Direct from pit)	
Furnace lining, molding coarse, sand blast	3.60
Stone sawing, traction	2.30
St. Louis, Mo.—Red heavy molding	1.50@ 2.25
Red fine	1.50@ 2.00
Molding fine and brass	2.00@ 3.00
Skein core	1.75@ 2.25
White core sand	1.00@ 1.75
Sand blast	2.00@ 4.50
Furnace lining	1.50@ 2.50
Sand blast	2.00@ 4.50
Roofing sand	1.00@ 1.50
Stone sawing	1.25@ 2.00
Thayers, Pa.—Core	2.00
Furnace lining, molding fine and coarse	1.25
Traction	2.00
Utica, Ill.—Core, furnace lining, molding coarse, brass molding	.85@ 1.50
Molding fine, traction	1.50
Roofing sand, stone sawing	1.50@ 2.00
Sand blast	2.00
Warwick, Ohio.—Furnace lining, dry 2.75, green	2.00
Molding fine and coarse, dry 2.75, green	1.75
Traction and brass molding	2.50
Zanesville, Ohio.—Molding fine, brass molding	1.75@ 2.00
Molding coarse	1.50@ 1.75

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Asheville, N. C.—Best white and 200-mesh (per ton)	8.00
Yellow (per ton)	9.00
Red (per ton)	13.00
Baltimore, Md.—Crude talc (mine run)	3.50
Ground talc (20-50 mesh), bags	10.00
Ground talc (150-200 mesh), bags	12.00
Cubes	60.00
Blanks (per lb.)	.08
Chatsworth, Ga.—Grinding	5.00
Ground talc (150-200 mesh); bags	12.00@20.00
Pencils and steel workers' crayons (gross)	1.50@ 2.50
Chester, Vt.—Ground talc (150-200 mesh), bulk	6.50@ 8.50
(Bags 1.00 extra)	
Emeryville, N. Y.—325 mesh (double air floated), bags	14.75
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run) per 2000-lb. ton	2.50@ 3.50
(150-200 mesh), bags	10.00@12.50
Los Angeles, Calif.—Crude	15.00@22.00
Los Angeles, Calif.—Crude talc f.o.b. Silver Lake	7.00@12.00
Ground talc (150-200 mesh), 100-200 lb. bags)	12.00@14.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk, 5.00; bags	6.00
(150-200 mesh); bulk, 7.00; bags	8.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
Ground talc (150-200 mesh), bulk	10.00@22.00
Vermont—Ground talc (20-50 mesh); bags	7.50@10.00
Ground talc (150-200 mesh); bags	8.50@15.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	5.00
(Bags 1.00 extra)	
Ground talc (150-200 mesh), bulk	8.00@14.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

(Raw Rock)

Per 2240-lb. Ton

Centerville, Tenn.—B.P.L. 65%	6.00@ 8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68-72%	5.50@ 6.50
Mt. Pleasant, Tenn.—Analysis, .65-70% B.P.L. (2000 lb.)	6.50
Paris, Idaho.—2000 lb. mine run, B.P.L. 70%	3.50

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$8.40	$8.10	$7.50
24x14	10.20	8.40	8.10	7.50
22x12	10.80	8.70	8.40	7.80
22x11	10.80	8.70	8.40	7.80
20x12	12.60	9.00	8.70	8.10
20x10	12.60	9.00	8.70	8.10
18x10	12.60	9.00	8.70	8.10
18x 9	12.60	9.00	8.70	8.10
16x10	12.60	8.70	8.40	7.80
16x 9	12.60	8.70	8.40	7.80
16x 8	12.60	8.70	8.40	7.80
18x12	12.60	9.00	8.70	8.10
16x12	12.60	8.70	8.40	7.80
14x10	11.10	8.40	8.10	7.50
14x 8	11.10	8.40	8.10	7.50
14x 7 to 12x6	9.30	8.10	7.50	7.50
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

(Ground Rock)

Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. ton	
Barton, Fla.—Analysis, 50-65% B.P.L.	3.50@ 8.00
Centerville, Tenn.—B.P.L., 60-65%	6.50
B.P.L. 75% (brown rock)	12.00
Benotis, Fla.—Analysis 77-82% B.P.L.	8.00
Montpelier, Idaho. — Analysis, 72% B.P.L., crushed and dried	3.75
Mt. Pleasant, Tenn.—B.P.L. 65%	5.60
Twomey, Tenn.—B.P.L. 65%	6.50

Florida Soft Phosphate

(Raw Land Pebble)

	Per Ton
Benotis, Fla.—Analysis 26-28% phosphoric acid—200 lb. sacks, carload lots	10.00
Jacksonville (Fla.) District	10.00@12.00

(Ground Land Pebble)

	Per Ton
Jacksonville, Fla., District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65% B.P.L.	5.95

Fluorspar

Fluorspar—80% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	22.00
Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	23.50

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	16.00@20.00	16.00@20.00
Slate granules		6.50@ 7.00
Granville, N. Y.—Red slate granules		7.50
Harrisonburg, Va.—Blk. marble (crushed, in bags)		12.50
Ingomar, Ohio (in bags)	6.00@14.00	10.00@25.00
Milwaukee, Wis.		16.00@30.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsburg, N. J.	16.00@20.00	14.50@18.00
Poultney, Vt.—Slate granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.—(2000 lb.)		6.00@12.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags		
12½c extra	4.50	4.50

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	27.00@35.00
Carpenterville, N. J.	18.50	31.50@41.50
Easton, Pa.	16.00	40.00@60.00
Ensley, Ala.	16.00	26.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Friesland, Wis.	22.00	32.00
Houston, Tex.		19.50
Omaha, Neb.	18.00	30.00@40.00
Portland, Ore. (Del'd)	21.00	30.00@60.00
Puyallup, Wash.	20.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
St. Paul, Minn.	15.00	30.00@45.00
Salem, Ore.	25.00	35.00@50.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Springfield, Ill.	18.00	20.00@25.00
Wauwatosa, Wis.	14.00@15.00	26.00@65.00
Watertown, N. Y.	21.00@22.50	35.00@37.50
Winnipeg, Can.	18.00	26.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	11.00
Boston, Mass.	16.50
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	15.00
Michigan City, Ind.	12.00
Milwaukee, Wis. (delivered)	14.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Rives Junction, Mich.	12.00
Saginaw, Mich.	12.00
San Antonio, Texas	13.00
San Antonio, Texas (deliv. city lts.)	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	20.00
F.o.b. cars	16.00
Washington, D. C.	14.50

Gray Clinker Brick

El Paso, Texas	13.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton	
	Finishing	Common
Atlanta, Ga.	22.50	14.00
Baltimore, Md.	24.25	17.25
Cincinnati, Ohio	16.80	14.30
Chicago, Ill.	20.00	20.00
Dallas, Tex.	22.00	.....
Denver, Colo.	24.00	.....
Detroit, Mich.	21.00	20.00
Detroit, Mich.	21.00	20.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.	21.00	21.00
New York, N. Y.	18.20	13.10
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	.....
Seattle, Wash. (paper sacks)	24.00	.....

Portland Cement

Prices per bbl. and per bag net in carload lots

	Per Bag	Per Bbl.
Atlanta, Ga.	.....	2.78
Boston, Mass.	.....	2.68
Buffalo, N. Y.	.....	2.53
Cedar Rapids, Iowa	.62	2.48
Cincinnati, Ohio	.63½	2.54
Cleveland, Ohio	.61½	2.46
Chicago, Ill.	.55	2.20
Columbus, Ohio	.....	2.49
Dallas, Texas	.55	2.25†
Davenport, Iowa	.60¾	2.43
Dayton, Ohio	.....	2.48
Denver, Colo.	.....	2.65
Detroit, Mich.	.62	2.48
Duluth, Minn.	.56¼	2.14
Indianapolis, Ind.	.60¼	2.41
Kansas City, Mo.	.61¼	.....
Los Angeles, Cal. (less 5c dis.)	.....	3.26
Memphis, Tenn.	.....	2.84
Milwaukee, Wis.	.59¼	2.37
Minneapolis, Minn.	.62½	2.39
Montreal, Canada (sks. 20c ext.)	.....	2.40
New Orleans, La.	.....	2.83
New York, N. Y.	.....	2.40‡
Philadelphia, Pa.	.....	2.56
Phoenix, Ariz.	.....	3.70
Pittsburgh, Pa.	.56	2.35
Portland, Ore.	.....	3.05
San Francisco, Cal.	.....	2.63*
St. Louis, Mo.	.58¾	2.35
St. Paul, Minn.	.62½	2.39
Seattle, Wash. (10c bbl. dis.)	.....	2.90
Spokane, Wash.	.....	.....
Toledo, Ohio	.62	2.48

†Sack 10c ext.; 10c dis. 10 days.
‡Alongside dock, 2.70.
*Warehouse, 3.15.
NOTE—Add 40c per bbl. for bags.

Mill prices f. o. b. in Carload Lots to Contractors

	Per Bag	Per Bbl.
Buffington, Ind.	.48¾	1.95
Cincinnati, Ohio	.....	3.00†
Concrete, Wash.	.....	2.60
Dallas, Texas	.....	2.15
Dayton, Ohio	.....	2.85†
El Paso, Tex.	.....	3.20*
Hannibal, Mo.	.....	2.10
Hudson, N. Y.	.....	2.20
Indianapolis, Ind.	.....	2.96†
Leeds, Ala.	.....	2.20
Los Angeles, Calif.	.....	2.80
Louisville, Ky.	.....	2.92†
Memphis, Tenn.	.....	3.24†
Northampton, Pa.	.....	2.10
Phoenix, Ariz.	.....	4.30‡
Steelton, Minn.	.51½	1.95
Universal, Pa.	.50	2.00

†Including cloth sacks.
*Gross, 10c sacks and 10c per bbl. disc 10 days.
‡Gross, 15c sacks and 5c per bbl. disc. 10 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	——Plaster Board—— ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard. ⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	6.00	6.00	.....	13.00	.....	.....	.....	.....	.....	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	.....	5.00	10.00	10.00	10.00	.....	.....	31.00	.....	19.75	20.00	30.00
Hanover, Mont.	4 50	.....	6.00	10.00	.....	10.50	.....	.....	.....	.....	.....	.....	.....
Mound House, Nev.	.....	8.50	6.50	10.50@11.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	.....	.....	10.00	11.00	11.50	.....	.....	33.75	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	.....	16.40	.....	.....	.....	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

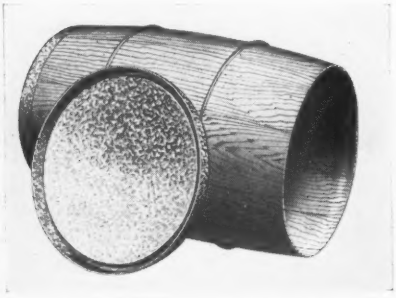
NOTE—Returnable Bags, 10c each; Paper Bags, $1.50 per ton extra (not returnable).
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton

New Machinery and Equipment

A Unit Hoop-Head for Barrels

A UNIT hoop-head for barrels which eliminates stave tapering and grooving in chimes, has been developed by the Helena Unit Hoop-Head Co., Helena, Ark.

The unit hoop-head is made out of No. 28 gage steel and is stamped out in one piece. It is black lacquered, preventing rust, and when placed on the staves makes an air-tight and indestructible barrel. It saves installing both top and bottom hoops in the barrel.



A unit barrel hoop-head stamped in one piece ready to be applied to the barrel

The hoop-head comes nested and is clapped on the barrel. It is then burred, any kind of an edge tool being used to perform this operation. The joints are air-tight, and due to the fact that this type head obviates the necessity for tapering stave end or grooving inside for chimes, the resulting barrel is much stronger.

The company claims that this type of head will save at least 200 per cent in the making of the barrel and 300 per cent in the finishing operation. It is further claimed that one cooper can make five complete barrels using the unit hoop-head, where he could only make one of the old type of barrel.

Another advantage claimed for this type of head is that a manufacturer possessing his own die can stamp his company insignia on the head, thus eliminating all stencil and labor work. The head makes a well-appearing barrel that will bear up under severe shipping conditions.

The "unit hoop-head" is the invention of John O. Willson, sales manager of the Moss De Vry Lime Co., St. Joe, Ark.

The Helena Unit Hoop Head Co. has just been organized and a plant is under construction at Helena, Ark. Active production on the unit hoop-head will begin in January, 1924. John O. Willson is president of the company; J. N. Straus, vice-president; and D. T. Hargraves, secretary and treasurer.

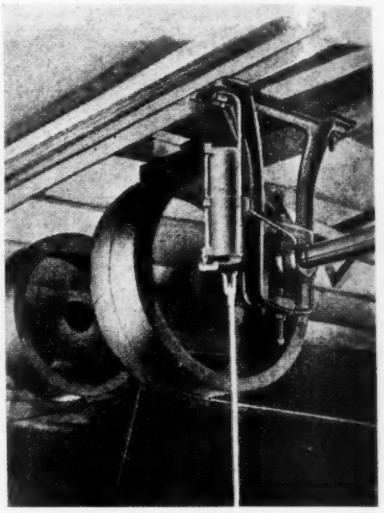
View of hoop-head in place

An Easily Operated Shaft Oiler

THAT shafting is hard to oil is a good reason which prevents it from getting the attention it needs. The device manufactured by the Ricker Mfg. Co., Rochester, N. Y., makes it possible to oil shafts with ease from a position on the floor by turning a wing nut with a stick. It also saves time spent in dragging a ladder around and stopping to set it up every few minutes.

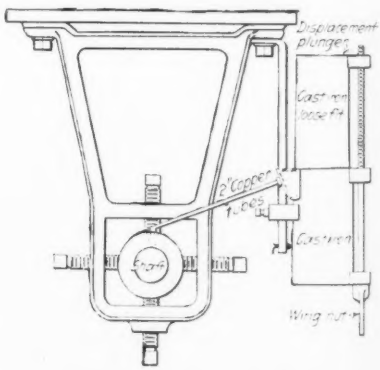
The device has two principal parts, a cylinder containing oil and a displacing plunger. An iron suspension rod holds the device in position at one side of a shaft hanger.

The plunger which displaces the oil is mounted on an upright and operated by a traversing screw running in lugs which are cast with the two parts of the oiler. At the bottom of this screw a wing nut is provided, which may be engaged by a socket on the end of a pole sufficiently long so that the oiler may be manipulated from the floor.



Oiling device for line shafts

From the upper part of the oil container two tubes run to oil holes on either side of the bearing. One turn of the wing nut on the traversing screw by means of the pole forces sufficient oil into the shaft bearing. The container holds enough oil to last a year.



Sketch of oiling device

STURTEVANT

Moto-Vibro Screen

Vibration that Vibrates
Every Wire and Every part of Every Wire
Nothing can remain still on this Screen
It must either pass through or over
10 mesh cloth presents 25,920 openings
100 mesh cloth presents 259,200 openings
in each Screen Unit
All of these meshes are gaping holes
Kept clean by vibrations
All four sides of each opening are vibrated 1800 times per minute.

All particles too large to pass are immediately rejected and those smaller than the meshes cannot help falling through.

The vibration is equally efficient all over the screen; whether at top, bottom, middle or sides, there are no high, low or dead spots.

It is simple, durable, accessible, has no auxiliaries, no motor generator and is less expensive than most screens.

STURTEVANT MILL CO. HARRISON SQUARE **Boston, Mass.**

News of All the Industry

Incorporations

The Buffalo Portland Cement Co., Columbus, Ohio, has been incorporated for $500,000 by A. L. Goodman.

The Southland Portland Cement Co., Nashville, Tenn., has been incorporated for $1,500,000 by J. C. Parker, L. H. Wright, B. L. Ireland, J. R. Aust and O. Mather. It will operate a plant at Crab Orchard in Cumberland county.

The Dietrich Roofing Co., Inc., Brooklyn, N. Y., has been incorporated for $4000 by Mary Dietrich, F. C. Dietrich, Jr., Brooklyn, and H. C. Wortman, Woodhaven.

The Atrax Corp. of America, Manhattan, N. Y., has been incorporated for $10,000 by J. Gensler and P. L. Ross. D. Goldberg, 276 Fifth avenue, New York, is the attorney.

The Scobee Limestone Co., Winchester, Ky., has been incorporated for $200,000 by R. B. Scobee, J. C. Scobee and J. F. Winn, to develop limestone deposits.

The Pyramid Portland Cement Co., Des Moines, Iowa, has been incorporated for $100,000 by A. O. Hauges, A. C. Pearsall and F. H. Mackmal.

The Luxemburg Cement Concrete Water Proof Co., Luxemburg, Wis., has been incorporated for $4200 by W. E. Cleereman, J. M. Meeziva and S. Libal.

The Standard Sand and Gravel Co., Dallas, Texas, has been incorporated for $1000 by M. Whitley, E. C. Lumley and J. E. Armstrong.

The Clinton Sand and Gravel Co., Clinton, Iowa, has been incorporated for $10,000 by H. A. Campbell, A. E. Stone, R. W. Johnson, O. Harrold, and H. F. Gray, to mine and deal in sand and building materials.

The Seneca Concrete Corp., Buffalo, N. Y., has been incorporated for $25,000 by A. B. Wilkerson, A. Goebel and S. Fehr.

The Huntsville Stone and Crushing Co., has been incorporated in Huntsville, Texas for $50,000, by G. M. Picton, A. N. Peckhan and A. F. Paul.

The Peninsular Stone Co. has been incorporated at 9825 Greeley ave., Detroit, Mich., for $30,000.

The Lawrence Stone and Gravel Co. has been incorporated in Raleigh, N. C., for $1,000,000, by S. Lawrence and T. B. Cowper, Raleigh, and W. R. Bonsal, Charleston, S. C.

The Threewit-Cooper Cement Co. has been incorporated in Denver, Colo., for $50,000, by J. Threewit, H. H. Cooper and others.

Sand and Gravel

The Cherokee Sand and Gravel Co., Knoxville, Tenn., will erect a sand elevator to cost $4000.

The Quality Sand and Gravel Co., Springville, N. Y., plans the installation of equipment for digging, conveying, loading, etc., on property to be operated on Waverly street. Stephen Engle is president and J. P. Healey, secretary and treasurer. The company was recently organized.

The Victory Gravel Co., Monroe, La., has purchased at a cost of approximately $10,000 to $15,000, barge equipment and will establish a barge line service on the Ouachita river to haul gravel and sand from gravel pits in northeast Louisiana.

The Stewart Sand Co., of Kansas City, Mo., purchased 53 acres of land on the Kaw river south of Edwardsville for $20,000. E. M. Fuga represented the sand company and stated the land was acquired for future development, and in time tracks and storage houses for drying and handling sand will be built.

The Evansville Sand and Gravel Co., Evansville, Ind., according to an announcement by Bert Koenig, secretary, is building a towboat to be named the "Eichel" and to be ready for service by October 1. The new steamer will be used in towing the gravel fleets of the company on the Ohio river and tributaries. The oil steamer "H. S. Hennen" is now engaged to tow the fleets of the company. The steamer "Crown Hill," formerly used for this purpose has been sold to Menke Bros. and will be used in the towing of a large river show boat. The steamer "Hennen" is 100-hp. and equipped with a Deisel engine, the boat having been built recently at Tell City, Ind., at a cost of about $25,000.

Evansville, Ind.—Sand and gravel companies operating on the Ohio and Wabash rivers have been doing a fine business this summer and trade has been much better than it was during the first half of last year. The gravel fleets on White river also have been busy. The sand and gravel companies at Shawneetown, Ill., Grayville, Ill., and Vincennes, Ind. have been getting out a lot of sand and gravel for road improvement work in southern Indiana and southern Illinois.

Lime

The Marion County Lime Co., Ocala, Fla., recently organized with a capital of $250,000, has tentative plans for a local plant estimated to cost $100,000, including machinery. E. H. Fitch is president.

The Union Lime Co., of Los Angeles, Calif., is about to begin erection of a $9000 warehouse at 3230 San Fernando road.

The Crystal Carbonate Lime Co. will rebuild its mill in Elsberry, Mo., which was recently destroyed by fire.

The Ash Grove Lime and Portland Cement Co. will begin operation of its hydration plant recently completed at Galloway, Mo., shortly. The plant was erected at a cost of $15,000.

The Legore Lime Co.'s plant at Frederick, Md., was destroyed by fire recently with a loss estimated at $75,000. The plant will be rebuilt.

The Midway Lime and Portland Cement Co., recently incorporated at Culver City, Calif., has appointed the following directors: J. J. Reichel, B. E. Anderson and J. C. Longueville, all of Los Angeles.

The M. J. Grove Lime Co.'s lime plant east of Frederick, Md., was partly destroyed by fire, with a loss estimated at $50,000. The fire is supposed to have originated from spontaneous combustion. The loss is covered by insurance and the plant will be rebuilt.

Laurel, Miss.—Residents of Jasper county are endeavoring to get an appropriation from the next legislature to establish a lime plant 4 miles west of Bay Springs. An unlimited supply of Vicksburg formation of lime is located there and a plant at that point will make it possible for farmers in this section to get lime in the amounts needed and when needed, it is said.

Cement

The Ogden Portland Cement Co., Ogden, Utah, has appointed the following officers and directors; C. A. Day, president; H. C. Day, vice-president; R. B. Porter, 2nd vice-president; C. R. Hollingsworth, secretary; who with W. H. Wattis, J. D. Peters and W. H. Harris form the directorate. F. W. Bletcher is treasurer.

Roy G. Wallace, S. P. Witt and others of Lenoir City, Tenn., are interested in establishing a $1,000,000 portland cement plant.

Agstone

Faribault, Minn.—Soil and alfalfa day was held August 3 at the two Kenyon experiment fields of the University of Minnesota to demonstrate grinding of limestone, testing of soil samples brought in by farmers, field demonstrations and chemical laboratory tests. Prof. Andrew Boss, vice-director of Minnesota Agricultural Experiment Station, explained the work on the experiment fields with a discussion on the main soil problems in southeastern counties by members of the Division of Soils.

W. E. Spreiter, Onalaska, Wis., conducted an all-day tour to many farms in the county and the value of lime as a fertilizer, of alfalfa as a hay crop and the importance of innoculation, were definitely shown.

J. Grantham, of the soils department of the Michigan Agricultural College reports marl with 90 per cent pure lime has been located on four farms near Eaton Rapids and says it is worth $1 a yard at the pit.

County Agent Stall, held a limestone meeting on the D. Empson farm in Grassy Fork township, Ind., where about 20 farmers heard W. A. Ostrander of Purdue speak. Mr. Stall plans to take up the discussion of the uses of limestone at the various township Farm Bureau meetings during August.

Quarries

The Paint Pigment Co. of America, Inc., Knoxville, Tenn., has perfected plans for the establishment of a local plant for the production of paint pigments from iron ore. Machinery will soon be installed. Max Grant is president.

J. P. McConnell, H. C. Tyler, Radford, Va., are interested in establishing of quarry and stone crushing plant.

The Southern Marble and Quarrying Corp., of which W. S. Lincoln is vice-president and manager, has purchased and leased 1200 acres of marble land.

The Gulf Crushing Co., Inc., 816 Howard ave., New Orleans, La., has let the contract for erection of a crushing plant with capacity of 175 tons every 10 hr., at Morgan City, La.

The Northwest Magnesite Co., Chewelah, Wash., has recently installed a large electric shovel at the Finch quarry, according to reports. When the company puts on a full crew in the fall, the shovel will be operated at full capacity. For the present operations are curtailed until the surplus stocks of Austrian magnesite are consumed, and it is estimated that the local plant will be in full operation in about three months.

Enid, Okla.—Red shale is rapidly becoming one of the leading materials used in the construction of hard-surfaced roads in Garfield county. The shale is easily accessible and several test roads built recently have shown that it is almost as durable as asphalt and costs considerably less, according to county commissioners. The shale will probably be used in the construction of a road program under consideration here, according to the commissioners.

The Mickler and McLeod Co., Lacoochee, Fla., is operating its limestone quarries full capacity. The rock is being used for roads at Hillsborough. The deposit of rock covers an area of 9 acres and borings have shown that it can be economically mined for a depth of 50 ft. Below that depth water is found, which may make it impracticable to work deeper. The rock is so porous that the heaviest rains are absorbed as rapidly as they fall.

Messrs. Hahn and Kohler, Blackwell, Okla., have purchased the granite quarries from the Dark Blue Mountain Co., Cold Springs, Okla., and will operate them at increased capacity. They have also purchased the Mahogany Granite quarries at Snyder.

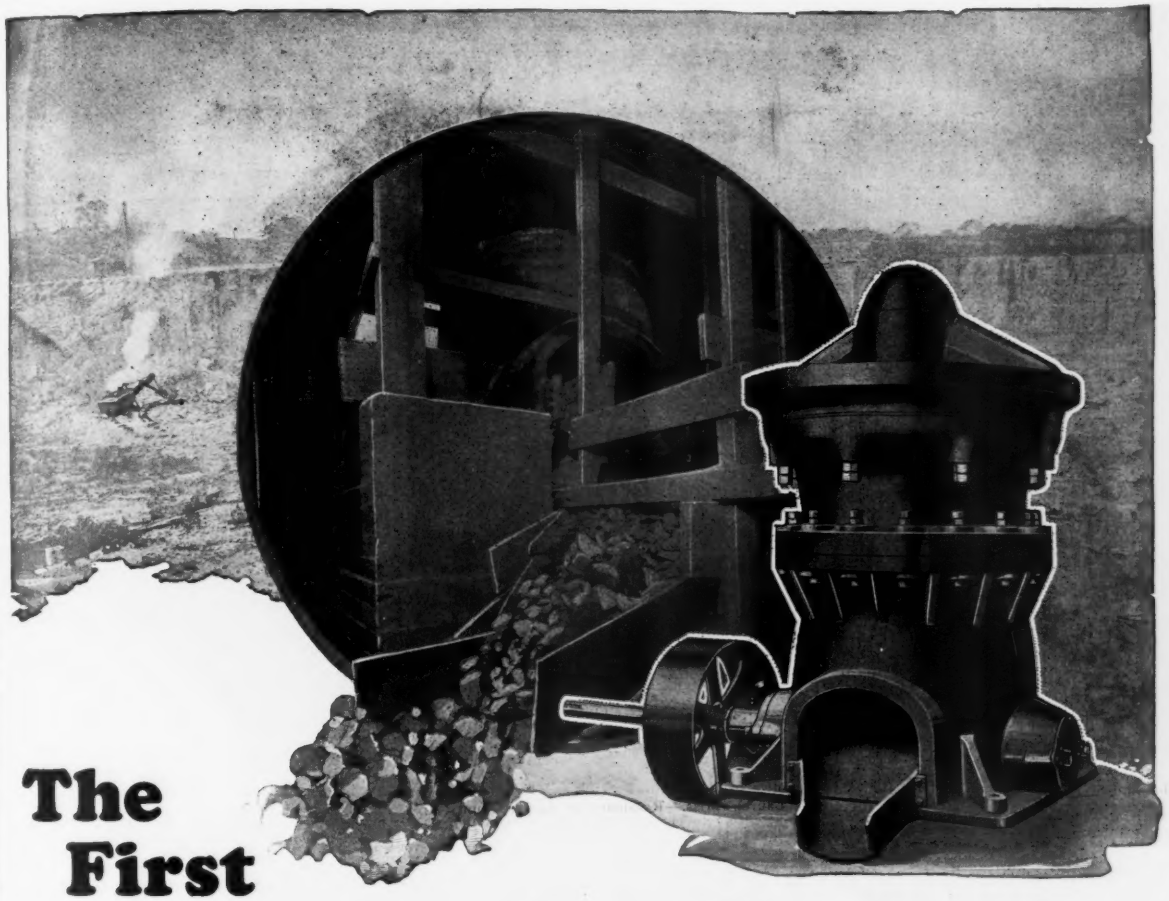
Manufacturers

The Connecticut Blower Corp., Hartford, Conn., has been incorporated under the laws of Deleware with capital of $250,000. M. E. Keeney, president; C. H. Keeney, treasurer; C. E. Keeney, secretary. It has taken over the International Blower Co. and the Hartford Sheet Metal Works. The products manufactured and installed, says the Connecticut Blower Corp., are of a large variety, such as blowers and exhaust fans, blower systems of all kinds, dust-collecting systems, exhaust systems, ventilating systems, etc. The plant of the International Blower Co. will be utilized until fall, at which time a considerably larger plant will be occupied.

The W. N. Best Corp., 11 Broadway, New York City, is now conducting the business formerly conducted by the W. N. Best Furnace and Burner Corp. The corporation states that "we plan to carry on the business in the same efficient manner in which it has been carried on and extend it in a number of ways. We are prepared to supply and install any portion of our equipment with furnaces designed to maintain the highest efficiency." Joseph D. Sears has been elected president of the new corporation and A. H. Best its vice-president. The same persons identified with the company will continue with the new corporation and additions have been made to the board of directors.

Personal

B. C. Wheeler, advertising manager of the Marquette Cement Co., Chicago, explained to members of the Davenport Advertisers' Club, Davenport, Iowa, advertising methods as found practical for boosting the sales of a single product like cement, as used by his company.



The First Superior McCully Crusher Bought in 1909

. . . and the success of the first sold three more

The Elmhurst Chicago Stone Company bought the first short shaft gyratory made by Worthington at the Power & Mining Works. This was in 1909. In 1912 they installed a duplicate. In 1914 another Superior McCully went into the same plant and in 1922 they installed the fourth Worthington gyratory. Every one of these crushers, excepting the first, was bought purely and solely on the basis of past performance, the way that you can buy crushers, too—if you get Worthington gyratories.

WORTHINGTON PUMP AND MACHINERY CORPORATION

Executive Offices: 115 Broadway, New York City. Branch Offices in 24 Large Cities W-207.8

WORTHINGTON

Deane Works, *Holyoke, Mass.*
Blake & Knowles Works *East Cambridge, Mass.*
Worthington Works *Harrison, N. J.*
Laidlaw Works, *Cincinnati, Ohio.*
Hazleton Works, *Hazleton, Pa.*
Gas Engine Works, *Cudahy, Wis.*
Power & Mining Works *Cudahy, Wis.*
Snow-Holly Works *Buffalo, N. Y.*
Epping-Carpenter, *Pittsburgh, Pa.*

Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in this issue of Rock Products

Air Compressors
Pennsylvania Pump & Compressor Co., Easton, Pa.
Worthington Pump & Mchy. Corp., New York City

Air Separators
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mchy. Co., Kingston, N. Y.

Automatic Weighers
Richardson Scale Co., Passaic, N. J.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Babbitt Metal
Ajax Metal Co., Philadelphia, Pa.
Lewistown Fdy. & Machine Co., Lewistown, Pa.

Bags and Bagging Machinery
Jaite Co., Jaite, Ohio

Balls (Tube Mill, etc.)
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Hardinge Co., New York, N. Y.
Worthington Pump & Mchy. Corp., New York City

Belt Fasteners and Hooks
Crescent Belt Fastener Co., New York City

Belt Lacing and Rivets
Crescent Belt Fastener Co., New York City

Bins and Bin Gates
Austin-Western Road Machinery Co., Chicago, Ill.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Easton Car and Construction Co., Easton, Pa.
Smith Engineering Works, Milwaukee, Wis.
W. Toepfer & Sons Co., Milwaukee, Wis.
Weller Mfg. Co., Chicago, Ill.

Blasting Powder
Atlas Powder Co., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

Boiler Insulation
Celite Products Co., Chicago, Ill.

Boilers (Waste Heat)
Edge Moor Iron Works, Edge Moor, Del.

Boilers (Water Tube)
Edge Moor Iron Works, Edge Moor, Del.
Jackson & Church Co., Saginaw, Mich.

Box Car Loaders
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Brick Machinery
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Jackson & Church Co., Saginaw, Mich.
Shope Brick Co., Portland, Ore.

Buckets (Elevator and Conveyor)
American Manganese Steel Co., Chicago Heights, Ill.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Hendrick Mfg. Co., Carbondale, Pa.
Lewistown Fdy. & Machine Co., Lewistown, Pa.
Smith Eng. Works, Milwaukee, Wis.
W. Toepfer & Sons Co., Milwaukee, Wis.
Weller Mfg. Co., Chicago, Ill.

Buckets (Grab, Clambshell, etc.)
Brown Hoisting Mchy. Co., Cleveland, Ohio
Industrial Works, Bay City, Mich.
McMyler Interstate Co., Cleveland, Ohio
Orton & Steinbrenner, Chicago, Ill.

Burr Mills
Butterworth & Lowe, Grand Rapids, Mich.
Munson Mill Machinery Co., Utica, N. Y.

Cableways
Interstate Equipment Corp., New York, N. Y.
Lidgerwood Mfg. Co., New York, N. Y.

Calcining Kettles (Gypsum)
American Process Co., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.

Car Pullers
Ottumwa Box Car Loader Co., Ottumwa, Iowa
Thomas Elevator Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

Cars (Quarry)
Atlas Car & Mfg. Co., Cleveland, Ohio
Easton Car and Construction Co., Easton, Pa.

Chain (Steam Shovel)
Carroll Chain Co., Columbus, Ohio

Chain Drives
Dodge Mfg. Corp., Mishawaka, Ind.

Clutches
Dodge Mfg. Corp., Mishawaka, Ind.

Coal Pulverizing Equipment
Hardinge Co., New York, N. Y.
Fuller-Lehigh Co., Fullerton, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Colors (Cement and Mortar)
C. K. Williams & Co., Easton, Pa.

Conveyors and Elevators
Austin-Western Road Machinery Co., Chicago, Ill.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Dodge Mfg. Corp., Mishawaka, Ind.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Link-Belt Co., Chicago, Ill.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
W. Toepfer & Sons Co., Milwaukee, Wis.
Universal Crusher Co., Cedar Rapids, Iowa
Universal Road Mchy. Co., Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Core Drilling
Pennsylvania Drilling Co., Pittsburgh, Pa.

Couplings
Knox Mfg. Co., Philadelphia, Pa.

Cranes (Crawler)
Brown Hoisting Mchy. Co., Cleveland, Ohio
Bucyrus Co., S. Miuwaukee, Wis.
Byers Machine Co., Ravenna, Ohio
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Koehring Co., Milwaukee, Wis.
Link-Belt Co., Chicago, Ill.
McMyler Interstate Co., Cleveland, Ohio
Northwest Engineering Co., Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., Marion, Ohio

Cranes (Locomotive)
American Hoist & Derrick Co., St. Paul, Minn.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Byers Machine Co., Ravenna, Ohio
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Northwest Engineering Co., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, Ohio
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., Marion, Ohio

Cranes (Overhead Electric Traveling)
Morgan Engineering Co., Alliance, Ohio

Crushers (Hammer)
Pennsylvania Crusher Co., Philadelphia, Pa.
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Crushers (Jaw and Gyratory)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Austin-Western Rd. Mchy. Co., Chicago, Ill.
C. G. Buchanan Co., New York City
Butterworth & Lowe, Grand Rapids, Mich.
Hardinge Co., New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Lewistown Fdy. & Machine Co., Lewistown, Pa. (Jaw)
Morgan Engineering Co., Alliance, Ohio
New Holland Machine Co., New Holland, Pa.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa
Universal Road Mchy. Co., Kingston, N. Y.
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo. (Jaw)
Worthington Pump & Mchy. Corp., New York City

Crushing Rolls
C. G. Buchanan Co., New York City
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
McLanahan Stone Machine Co., Hollidaysburg, Pa.
New Holland Machine Co., New Holland, Pa.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo.
Worthington Pump & Mchy. Corp., New York City

Derricks
Lidgerwood Mfg. Co., New York, N. Y.
Thomas Elevator Co., Chicago, Ill.

Dippers and Teeth (Steam Shovel)
American Manganese Steel Co., Chicago Heights, Ill.

Draglines
Bucyrus Co., S. Miuwaukee, Wis.
Erie Steam Shovel Co., Erie, Pa.
Koehring Co., Milwaukee, Wis.
Northwest Engineering Co., Chicago, Ill.
Osgood Co., Marion, Ohio

Dragline Cableway Excavators
Lidgerwood Mfg. Co., New York, N. Y.
Sauerman Bros., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.

Dredge Chain
Carroll Chain Co., Columbus, Ohio

Dredges (Hydraulic)
Ellicott Machine Corp., Baltimore, Md.

Dredges (Sand and Gravel)
American Manganese Steel Co., Chicago Heights, Ill.
Bucyrus Co., S. Miuwaukee, Wis.
Ellicott Machine Corp., Baltimore, Md.
Lidgerwood Mfg. Co., New York, N. Y.
Morris Machine Works, Baldwinsville, N. Y.
Thomas Elevator Co., Chicago, Ill.

Drills (Blast Hole)
Armstrong Mfg. Co., Waterloo, Iowa
Sanderson-Cyclone Drill Co., Orrville, Ohio

Dryers
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Process Co., New York, N. Y.
Buckeye Dryer Co., Chicago, Ill.
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Kennedy-Van Saun Mfg. and Eng. Corp., New York, N. Y.
Lewistown Fdy. & Machine Co., Lewistown, Pa.
McGann Mfg. Co., York, Pa.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

Dust Collecting Systems
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Dynamite
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio

Engineers
J. C. Buckbee Co., Chicago, Ill.
Robt. W. Hunt & Co., Chicago, Ill.
Kritzer Co., Chicago, Ill.
Richard K. Meade & Co., Baltimore, Md.
McGann Mfg. Co., York, Pa.
H. Miscampbell, Duluth, Minn.
Pennsylvania Drilling Co., Pittsburgh, Pa.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.
R. D. Wood & Co., Philadelphia, Pa.

Increasing Production with the Edge Moor Waste Heat System

DURING the past year four well-known mills have enlarged their Edge Moor Waste Heat Systems in order to increase their production capacity.

The Trinity Portland Cement Co., Dallas, Texas, installed another 1088 H. P. Edge Moor Waste Heat Boiler; the Northwestern States Portland Cement Co., Mason City, Iowa, put in another boiler rated at 932 H. P.; the Crescent Portland Cement Co., Wampum, Pa., added a 989 H. P. boiler; the Dewey Portland Cement Co., Dewey, Okla., installed an additional unit of 1088 H. P.

These four plants, and many others equally prominent, have proved by their own experience that it is possible to increase kiln capacity with the Edge Moor Waste Heat System, at the same time effecting a very substantial reduction in fuel consumption.

Other plants that have installed Edge Moor Waste Heat Systems this year include Alpha Portland Cement Co., Martins Creek, Pa. (four 1189 H. P. boilers; third installation); Aetna Portland Cement Co. (one 805 H. P. boiler); Cayuga Operating Co. (two 883 H. P. boilers); Newaygo Portland Cement Co. (two 858 H. P. boilers); Pittsburgh Plate Glass Co. (cement mill—two 845 H. P. boilers); Chichibu Cement Co., Japan (two 832 H. P. boilers).

Each Edge Moor Waste Heat System is installed with a definite guarantee of efficiency. In every installation this guarantee has been exceeded. The average installation saves its cost in two to three years. More than 70% of the waste heat boiler horsepower in the cement industry has been installed by this company.

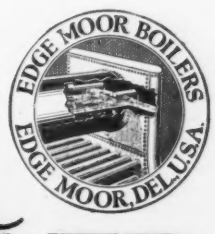
Let us send you complete information —without obligation, of course.

EDGE MOOR IRON COMPANY

Established 1868

EDGE MOOR, DELAWARE

New York *Chicago* *St. Paul* *Boston* *Pittsburgh* *Charlotte*



EDGE MOOR Water Tube BOILERS

FOR INCREASED FUEL ECONOMY

When writing advertisers please mention ROCK PRODUCTS

Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in this issue of Rock Products

Engines (Gasoline, Kerosene and Oil)
American Hoist & Derrick Co., St. Paul, Minn.
Armstrong Mfg. Co., Waterloo, Iowa
Climax Engineering Co., Clinton, Iowa
Power Mfg. Co., Marion, Ohio
Worthington Pump & Mchy. Corp., New York City

Engines (Steam)
American Hoist & Derrick Co., St. Paul, Minn.
Ellicott Machine Corp., Baltimore, Md.
Jackson & Church Co., Saginaw, Mich.
Morris Machine Works, Baldwinsville, N. Y.

Explosives (See Blasting Powder and Dynamite)

Frogs and Switches
Central Frog & Switch Co., Cincinnati, Ohio
Easton Car and Construction Co., Easton, Pa.

Fuses (Detonating and Safety)
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio
Hercules Powder Co., Wilmington, Del.

Gas Producers
Morgan Construction Co., Worcester, Mass.
R. D. Wood & Co., Philadelphia, Pa.

Gears (Spur, Helical, Worm)
Falk Corp., Milwaukee, Wis. (Helical)
Link-Belt Co., Chicago, Ill.

Grizzlies
Robins Conveying Belt Co., New York City
W. Toepfer & Sons Co., Milwaukee, Wis.
Traylor Eng. & Mfg. Co., Allentown, Pa.

Gypsum Plaster Plants
Butterworth & Lowe, Grand Rapids, Mich.

Hoists
American Hoist and Derrick Co., St. Paul, Minn.
Hyman-Michaels Co., Chicago, Ill.
Industrial Works, Bay City, Mich.
Jackson & Church Co., Saginaw, Mich.
Lidgerwood Mfg. Co., New York, N. Y.
Link-Belt Co., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

Hydrators (Lime)
Kritzer Co., Chicago, Ill.
Richard K. Meade & Co., Baltimore, Md.
H. Miscampbell, Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Insulation (Heat)
Celite Products Co., Chicago, Ill.

Kilns (Rotary)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
McGann Mfg. Co., York, Pa.
H. Miscampbell, Duluth, Minn.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

Kilns (Shaft)
McGann Mfg. Co., Inc., York, Pa.
H. Miscampbell, Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Lime Handling Equipment
Kritzer Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.
H. Miscampbell, Duluth, Minn.
Raymond Bros., Impact Pulv. Co., Chicago, Ill.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Sturtevant Mill Co., Boston, Mass.

Liquid Fuel Equipment
W. N. Best Corp., New York City

Loaders and Unloaders
Brown Hoisting Mchy. Co., Cleveland, Ohio
Hoar Shovel Co., Duluth, Minn.
Link-Belt Co., Chicago, Ill.
Northwest Engineering Co., Chicago, Ill.
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Locomotives (Steam, Gas, and Electric)
Baldwin Loco. Wks., Philadelphia, Pa. (Steam)
Davenport Loco. Wks., Davenport, Iowa (Steam and Gas)
Fate-Root-Heath Co., Plymouth, Ohio (Gas)
Ironton Eng. Co., Ironton, Ohio (Elec.)
Lima Locomotive Works, Lima, Ohio (Steam)
Milwaukee Loco. Mfg. Co., Milwaukee, Wis. (Gas)
Vulcan Iron Works, Wilkes-Barre, Pa. (Steam)

Lubricating Systems
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Manganese Steel (Castings, Repairs, etc.)
American Manganese Steel Co., Chicago Heights, Ill.
Hadfield-Penfield Steel Co., Bucyrus, Ohio

Mills, Grinding (Ball, Tube, etc.)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Hardinge Co., New York, N. Y.
Jackson & Church Co., Saginaw, Mich.
Lewistown Fdy. & Machine Co., Lewistown, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Worthington Pump & Mchy. Corp., New York City

Perforated Metal
Cross Engineering Co., Carbondale, Pa.
Harrington & King Perforating Co., Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
W. Toepfer & Sons Co., Milwaukee, Wis.

Portable Engines
Climax Engineering Co., Clinton, Iowa

Power Units
Climax Engineering Co., Clinton, Iowa

Pipe (Dredge, etc.)
R. D. Wood & Co., Philadelphia, Pa.

Pulleys (Magnetic)
C. G. Buchanan, New York, N. Y.

Pulverizers
Fuller-Lehigh Co., Fullerton, Pa.
Hardinge Co., New York, N. Y.
K-B Pulverizer Co., Inc., New York City
Kent Mill Co., Brooklyn, N. Y.
Munson Mill Machinery Co., Utica, N. Y.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Crusher Co., Cedar Rapids, Iowa
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Pumps (Sand and Gravel)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
Ellicott Machine Corp., Baltimore, Md.
Morris Machine Works, Baldwinsville, N. Y.

Pumps (Water, etc.)
Emerson Pump and Valve Co., Alexandria, Va.
Morris Machine Works, Baldwinsville, N. Y.
Pennsylvania Pump and Comp. Co., Easton, Pa.
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo.
Worthington Pump & Mchy. Corp., New York City

Rails
Easton Car and Construction Co., Easton, Pa.

Road Machinery
Austin-Western Rd. Mchy. Co., Chicago, Ill.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Koehring Co., Milwaukee, Wis.
Northwest Eng. Co., Chicago, Ill.
Universal Road Mchy. Co., Kingston, N. Y.

Scales (See Weighing Equipment)

Scrapers (Drag, etc.)
Austin-Western Rd. Mchy. Co., Chicago, Ill.
Northwest Eng. Co., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.

Screens
Austin-Western Rd. Mchy. Co., Chicago, Ill.
Cross Engineering Co., Carbondale, Pa.
Dodge Mfg. Corp., Mishawaka, Ind.
Harrington & King Perforating Co., Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Kent Mill Co., Brooklyn, N. Y.
Link-Belt Co., Chicago, Ill.
McLanahan Stone Mach. Co., Hollidaysburg, Pa.
Robins Conveying Belt Co., New York City
Smith Eng. Wks., Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
W. Toepfer & Sons Co., Milwaukee, Wis.
Traylor Eng. & Mfg. Co., Allentown, Pa.
W. S. Tyler Co., Cleveland, Ohio
Universal Crusher Co., Cedar Rapids, Iowa
Weller Mfg. Co., Chicago, Ill.
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Screens (Electric Vibrating)
W. S. Tyler Co., Cleveland, Ohio

Separators (Magnetic)
C. G. Buchanan, New York, N. Y.

Shovels (Steam, Gas and Electric)
Bucyrus Co., S. Milwaukee, Wis.
Erie Steam Shovel Co., Erie, Pa.
Hoar Shovel Co., Duluth, Minn.
Koehring Co., Milwaukee, Wis.
Northwest Engineering Co., Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., Marion, Ohio

Sprockets and Chain
American Manganese Steel Co., Chicago Heights, Ill.
Dodge Mfg. Corp., Mishawaka, Ind.

Steel Plate Construction
Hendrick Mfg. Co., Carbondale, Pa.
Jackson & Church Co., Saginaw, Mich.

Testing Sieves and Shakers
W. S. Tyler Co., Cleveland, Ohio

Track Equipment
Central Frog and Switch Co., Cincinnati, Ohio
Easton Car and Construction Co., Easton, Pa.

Tramways (Aerial Wire Rope
Interstate Equip. Corp., New York City
A. Leschen & Sons Rope Co., St. Louis, Mo.

Transmission Machinery
Dodge Mfg. Corp., Mishawaka, Ind.
Kritzer Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

Underground Loaders
Hoar Shovel Co., Duluth, Minn.

Valves (Throttle)
Emerson Pump and Valve Co., Alexandria, Va.
Knox Mfg. Co., Philadelphia, Pa.

Waste Heat Recovery Systems
Edge Moor Iron Works, Edge Moor, Del.

Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Lewistown Fdy. & Machine Co., Lewistown, Pa.
McLanahan Stone Machine Co., Hollidaysburg, Pa.
Smith Eng. Works, Milwaukee, Wis.
W. Toepfer & Sons Co., Milwaukee, Wis.

Weighing Equipment
Richardson Scale Co., Passaic, N. J.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Wheels (Car)
Easton Car and Construction Co., Easton, Pa.

Wire Cloth
Cleveland Wire Cloth Co., Cleveland, Ohio
Twin City Iron & Wire Works, St. Paul, Minn.
W. S. Tyler Co., Cleveland, Ohio

Wire Rope
American Steel & Wire Co., Chicago, Ill.
Armstrong Mfg. Co., Waterloo, Iowa
A. Leschen & Sons Co., St. Louis, Mo.
Williamsport Wire Rope Co., Williamsport, Pa.

Mr. Sand Man!

IF it's clean sand you want to produce and you are unable to do so, write to us and state your trouble and we can help you to solve your problem. We make machinery that produces the cleanest Glass Sand.

The Lewistown Equipment, which includes Crushing, Grinding, Screening, Washing, Drying and Conveying Machinery, will produce more and a better quality of Glass Sand, at a bigger profit than any other equipment on the market.

LEWISTOWN FOUNDRY & MACHINE COMPANY
Lewistown, Pa.

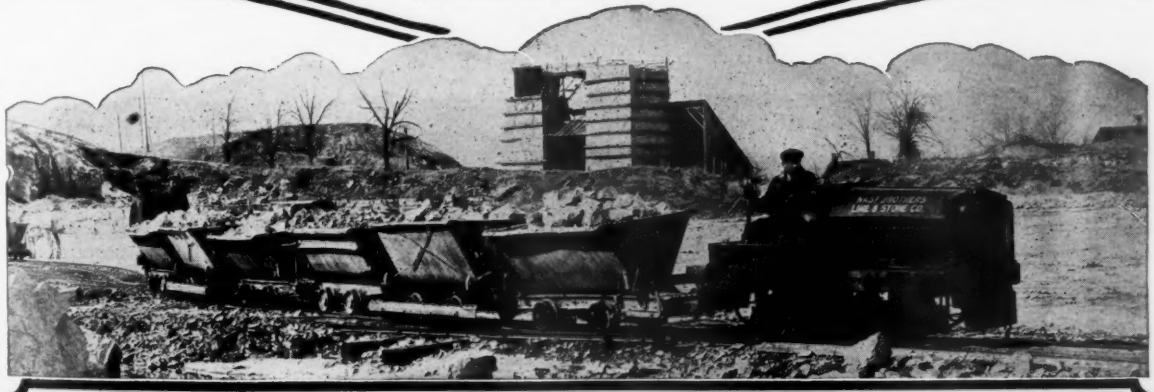
Every Milwaukee Locomotive Is a Profit Builder

And that's only one of the many reasons why Milwaukee Gasoline Locomotives are now being so generally adopted in the quarry, and general industrial field.
There's a type and size of Milwaukee Gasoline Locomotive for every class of haulage, and each and every one is sold on a positive guarantee based on actual performance.

You simply can't go wrong with a Milwaukee on the job

Publication O-121 tells all about them. Write for a copy to-day—NOW!

MILWAUKEE LOCOMOTIVE MFG. CO.
Milwaukee, Wis., U. S. A.



MILWAUKEE GASOLINE LOCOMOTIVES

WELLER-MADE EQUIPMENT

For Handling the Materials Mechanically

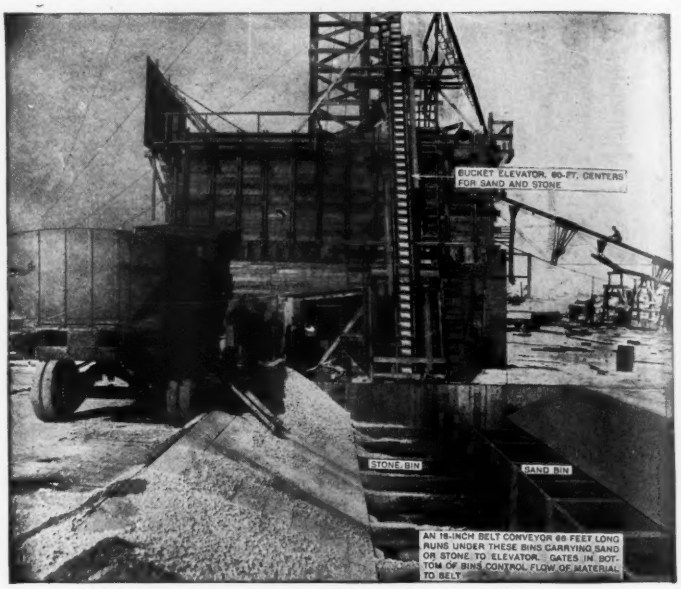
Increase the Output and Reduce Costs by Employing Weller-Made Machinery to Do the Work

It is sturdy and reliable. Never lays down on the job. The cost of operation is small. Will help pay dividends.

We Make
Conveyors of All Types

Bucket Elevators	Portable Elevators
Steel Storage Bins	Bin Gates
Screens	Sheet Metalwork, etc.

Write and let us know the kind of equipment you are interested in or the material you want to handle. Catalogues showing installations, also data to help in selection of equipment, will be sent.

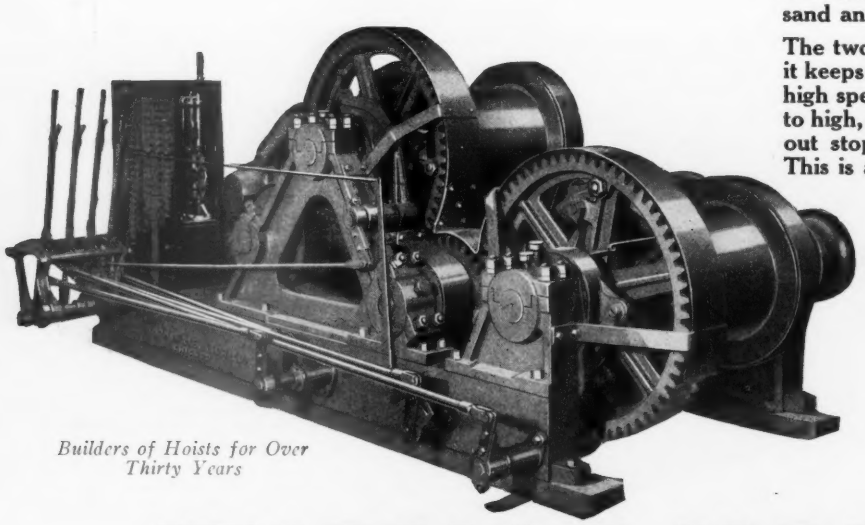

BUCKET ELEVATOR, 60-FT. CENTERS FOR SAND AND STONE
STONE BIN
SAND BIN
AN 18-INCH BELT CONVEYOR 66 FEET LONG RUNS UNDER THESE BINS CARRYING SAND OR STONE TO ELEVATOR. GATES IN BOTTOM OF BINS CONTROL FLOW OF MATERIAL TO BELT.

WELLER MFG. CO.

1820-1856 North Kostner Avenue SALES OFFICES **Chicago, Illinois**

New York Boston Baltimore Pittsburgh Cleveland San Francisco Salt Lake City

Specialized Hoists for Sand and Gravel



Builders of Hoists for Over Thirty Years

The Thomas Two-Speed Electric Slackline Cableway Hoist is an ideal hoist for sand and gravel.

The two speed device is so designed that it keeps pulling in the slow speed until the high speed takes effect; the shift from low to high, and vice-versa, can be made without stopping the rotation of the drums. This is an exclusive Thomas feature.

Ask for Bulletin No. 33

Thomas Elevator Company
27 South Hoyne Avenue
Chicago

THOMAS HOISTS

A Loader You Can Depend On

VERY SPEEDY

A Practical Way to Cut Costs.

A Real Asset to Your Plant

Just a real good box car loader for loading sand and gravel, crushed rock, salt, small coal, sulphur, ores and concentrates. Bulk lime or cement, phosphate, clay, grain, fertilizer and other bulk material.

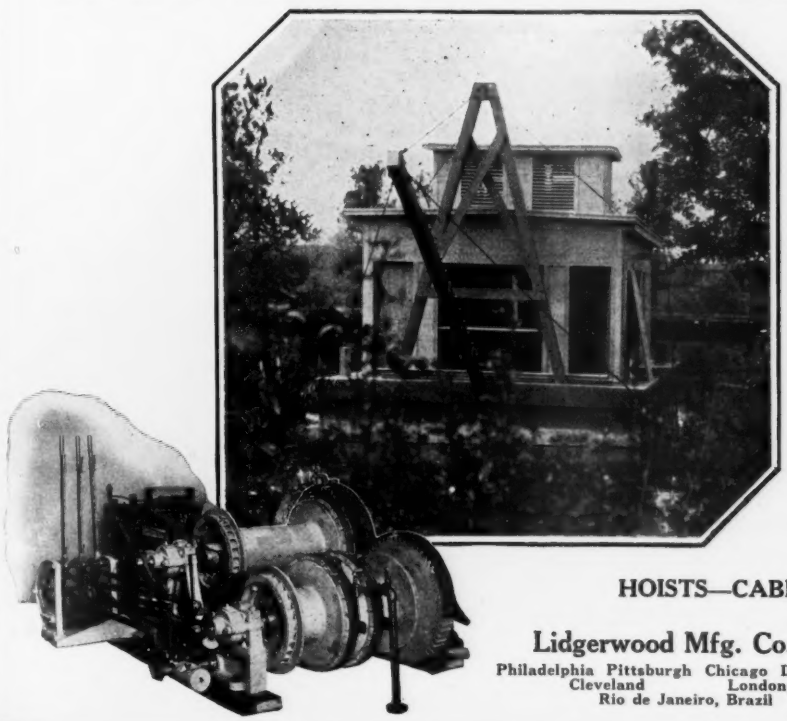
A light weight steel constructed conveyor with roller bearing wheels will allow for easy moving. Only one man part time required to operate. Power, either electric motor or gasoline engine.

Write Us Today for Full Details

MANUFACTURERS
OTTUMWA BOX CAR LOADER COMPANY, OTTUMWA IOWA.
BEST BOX CAR LOADERS AND UNLOADERS

ENGINEERING SERVICE FREE

LIDGERWOOD HOISTS



It's a mark of good judgment to use

Lidgerwood Hoists

And it was good judgment plus careful investigation that caused the Central Michigan Gravel Company, of Lansing, Michigan, to use a Lidgerwood hoist in their work.

They have found that this hoist is very easy on the engine, shifting from low to high speed without jerks or jars.

Every working part has the strength necessary for continuous and heavy production.

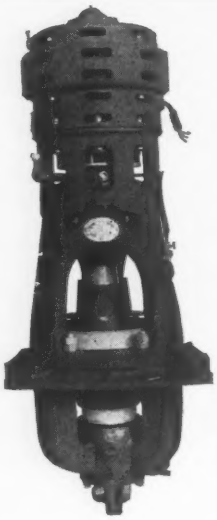
Lidgerwood Hoists are made to operate either by electricity or steam. Complete details of the different types of Hoists are given in Bulletin No. 35, which we would like to send you. *Write today for your copy.*

HOISTS—CABLEWAYS—DERRICKS

Lidgerwood Mfg. Co., 96 Liberty St., New York

Philadelphia Pittsburgh Chicago Detroit Seattle Los Angeles Birmingham, Ala.
Cleveland London, England Sao Paulo, Brazil
Rio de Janeiro, Brazil Apartado 812, Mexico, D. F.

The Weston Direct Drive Gyratory Crusher for Secondary Reduction of Hard Rock, Ore and Gravel



Developed in a Granite Crushing Plant

This machine fills the need for a secondary crusher of large capacity and great strength for work in all friable rock.

The first machine, installed more than two years ago, has established remarkable records for capacity, low power consumption and general economy in operation. Later installations have more than proved all claims for the machine.

The construction is all-steel with Chrome-Vanadium forged steel shaft of large size, and with full-bearing eccentric, bronze bushed inside and out.

The entire machine is arranged to give freedom from costly delays. Positive lubrication without pumps—Dust prevention in bearings—Greater wear on manganese before replacement—Ease of adjustment and repair—and a sturdy oversize motor—All work to your advantage.

Crusher is simple in design and the best practice in modern Engineering is utilized. Built in six standard sizes to follow any primary, smallest machine can be set to ½" with large capacity.

Arranged for direct motor, or belt drive.

Bulletin No. 25-A describes this machine in detail

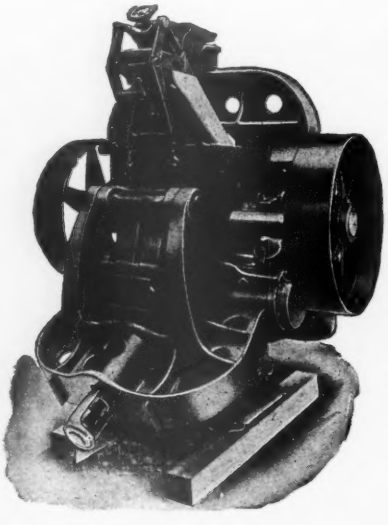
THE MORGAN ENGINEERING COMPANY

ALLIANCE, OHIO

Chicago
122 S. Michigan Ave.

Designers, Manufacturers and Contractors
Electric Traveling Cranes, Rolling Mill Machinery
Ordnance, Steel, Shipbuilding and Forging Plants Complete
Rock Crushers, Special Machinery for Any Purpose

Pittsburgh
1420 Oliver Bldg.
Birmingham, Ala.
Brown-Marx Bldg.



MAXECON MILL

For Fine Pulverizing of

Limestone, Gypsum, Phosphate, etc.

EFFICIENT—ECONOMICAL—RELIABLE

PERFECTECON SCREEN SEPARATOR

For Large Capacity Screening

Let These Solve Your Cost and Trouble Problems

KENT MILL COMPANY

10 Rapelye Street **Brooklyn, N. Y.**

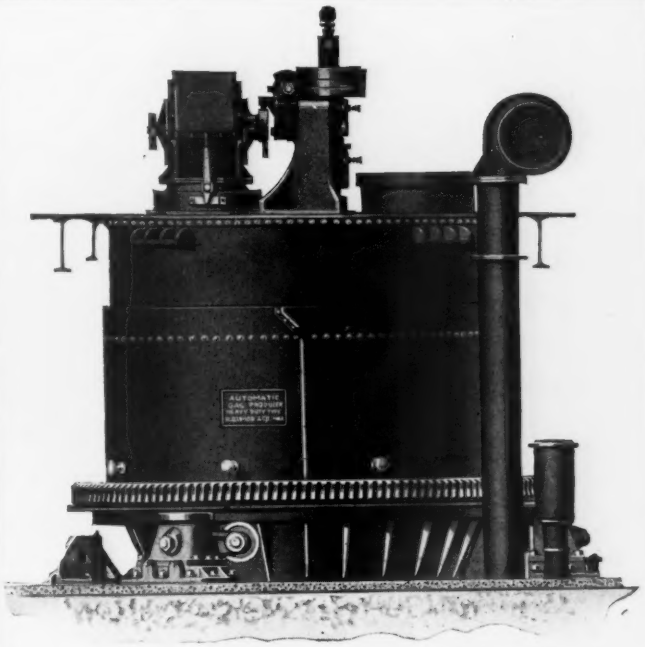
WOOD AUTOMATIC GAS PRODUCERS

You know that more economical gas producers in your plant will soon pay for themselves and save you money.

R. D. Wood and Company's Automatic Gas Producers will do just that. They are strongly built, which insures low upkeep, and their special features effect greater gas production per ton of coal than the ordinary kinds.

Used in Leading Lime Plants

Our catalog gives details. Mailed on Request.



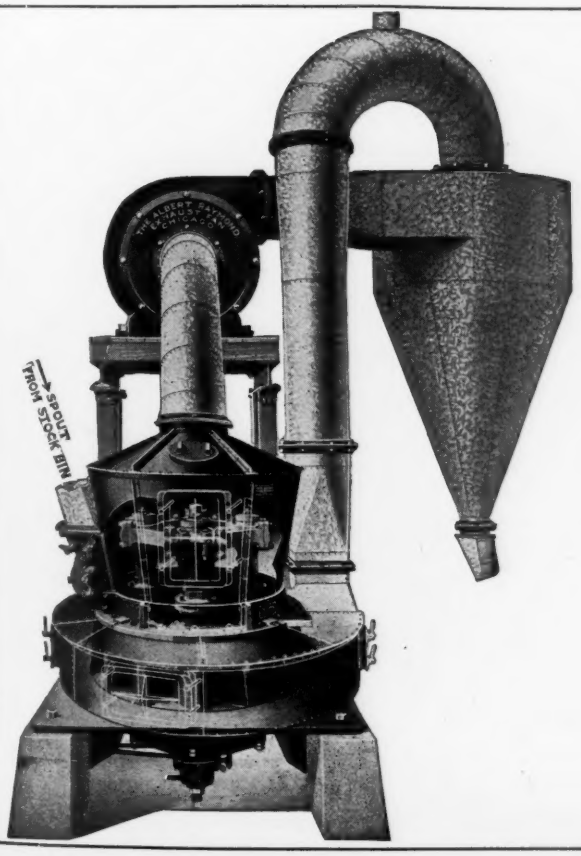
HYDRAULIC MACHINERY AND OPERATING VALVES

R. D. WOOD & CO.

ESTABLISHED 1803

PHILADELPHIA, PA.

CAST IRON PIPE, HYDRANTS AND VALVES



STATISTICS

335 Raymond Roller Mills equipped with Air Separation are grinding coal in 130 Plants.

They are employed by Cement and Chemical Plants, Copper Refiners, in the Steel and Iron Industry and Power Plants.

Conservatively speaking they grind over 10,000,000 tons of coal per year.

Raymond Bros. Impact Pulverizer Co.

1301 N. BRANCH ST. CHICAGO, ILL.

Eastern Office, 50 Church St., NEW YORK CITY

Western Office, 1002 Washington Bldg., LOS ANGELES

Moving Mountains Economically

The essential requirement of economical quarry operations is durability of equipment.

Missabi Dippers, made of Manganese Steel, the most enduring metal known, is the final answer to this requirement.

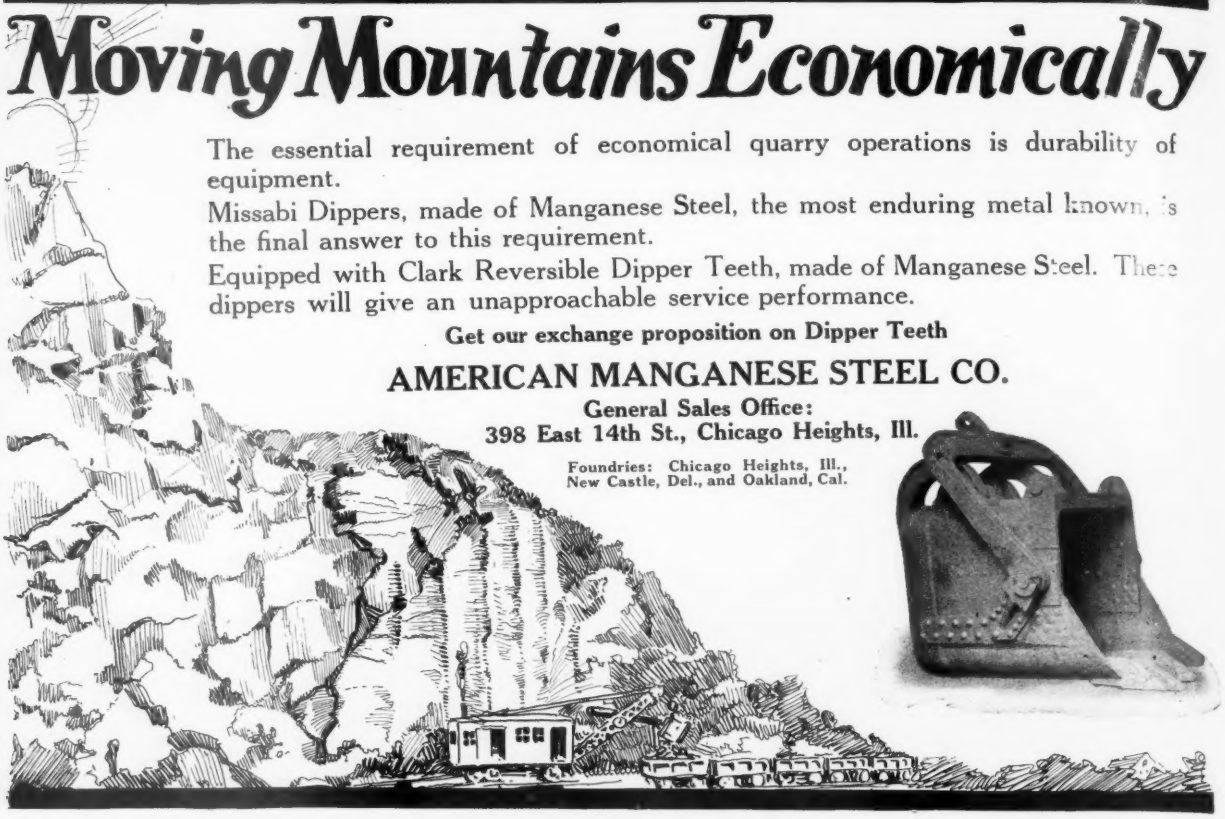
Equipped with Clark Reversible Dipper Teeth, made of Manganese Steel. These dippers will give an unapproachable service performance.

Get our exchange proposition on Dipper Teeth

AMERICAN MANGANESE STEEL CO.

General Sales Office:
398 East 14th St., Chicago Heights, Ill.

Foundries: Chicago Heights, Ill., New Castle, Del., and Oakland, Cal.



CARROLL

"CARROLL" SOLID WELD CHAINS

Praise for work well done reflects confidence that is born of performance. We all profit by the experience of others.

The Secretary of the Carbon Limestone Co., Youngstown, Ohio, writes:

"We have been using the Carroll Solid Weld Chain for the past year or more. So far we have had only one link break in the five or six chains we are using. This is a decided improvement over chains we have used in the past. We notice the Carroll Chain is practically free from stretching.

"We are using this chain on shovels Model 100, 80, 76 and 60 Marion, three of them digging heavy stone, the others handling heavy blasted shale and hard clay. One shovel is digging 65,000 yards per month."

The Carroll Chain Company, Columbus, Ohio

CARROLL CARROLL CARROLL

FALK
HERRINGBONE GEARS

Falk-Herringbone Ball Mill Gears—17 and 267 teeth; 2 D. P.; 16-in. face.

SERVICE—The Measure of Economy

The only true economy is **service** economy—estimated year after year throughout the life of the plant.

Falk Herringbone Gears measure up to this standard of economy because they keep the plant going day in and day out—because they save and use the maximum of generated power—because they are practically indestructible—and because they protect both the driving and the driven machinery against the wear of vibration.

Economize in power by installing Falk Herringbone Gears on your grinding and pulverizing machinery such as tube mills, ball mills, conical mills, etc., and on hoists, compressors and centrifugal pumps.

Our engineering department invites further inquiries in regard either to usual or unusual power transmission problems.

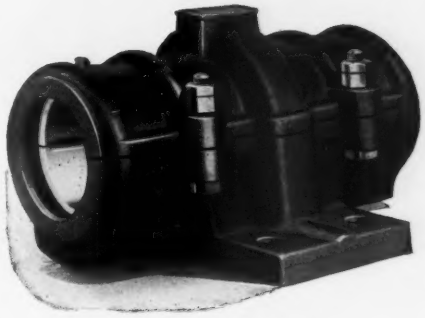
The Falk Corporation
MILWAUKEE - WISCONSIN

REPRESENTATIVES:

W. O. Beyer, 1007 Park Bldg., Pittsburgh, Pa.
M. P. Fillingham, 50 Church St., New York City.
F. W. Grimwood, Rialto Bldg., San Francisco, Cal.
General Machinery Co., Brown Marx Bldg., Birmingham, Ala.
Vulcan Iron Works, Wilkes-Barre, Pa.
Denver Engineering Works, Denver, Colo.
Engineering Equipment Co., Ltd., 358 Beaver Hall Square, Montreal, Quebec, Canada.

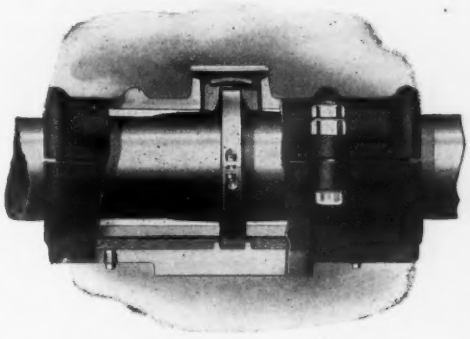
FOREIGN REPRESENTATIVES: Gustav Melms, 3 Rue Taitbout, Paris.

Lubrication Is Positive Economical and Safe



Collar Oiling Flat Box

Reduce lubrication expense in your operation by using bearings of the type shown.



Sectional View of Collar Oiling Box

Building a complete line of reliable power transmission machinery, we offer the services of our engineers to help solve your transmission problems and request the opportunity to quote on your requirements. With our splendid facilities there is no inquiry too small for our careful attention nor too large for us to handle.

ALLIS-CHALMERS
MANUFACTURING COMPANY

ELECTRICAL MACHINERY
STEAM TURBINES — STEAM ENGINES
HYDRAULIC TURBINES
GAS ENGINES — OIL ENGINES
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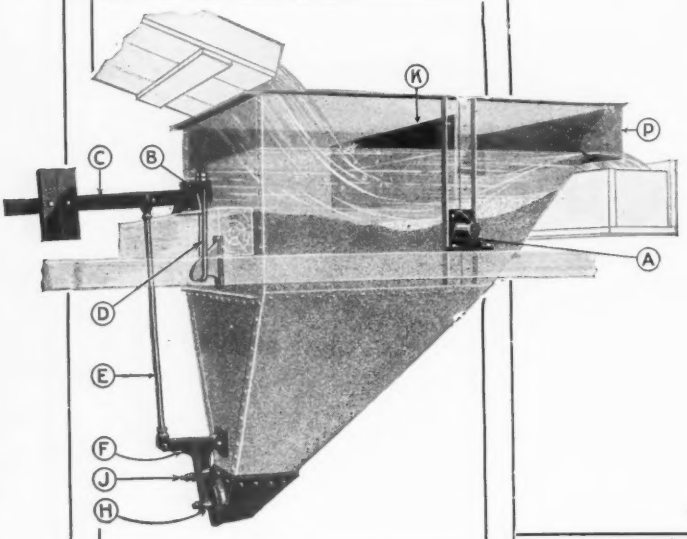
PUMPING ENGINES
CENTRIFUGAL PUMPS
CONDENSERS
AIR COMPRESSORS — AIR BRAKES
STEAM AND ELECTRIC HOISTS
AGRICULTURAL MACHINERY
POWER TRANSMISSION MACHINERY

MILWAUKEE, WISCONSIN. U.S.A.

TELSMITH



SAND TANK

DELIVERS CLEAN DRY SAND—

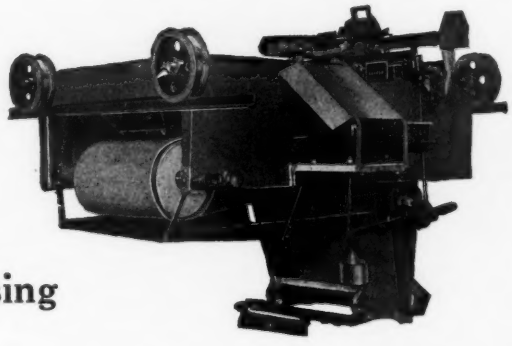
The Telsmith Sand Tank and its counterweight-arm are both carried on knife-edge bearings, with a wide range of adjustment. As the tank pivots one way, the valve plate pivots in the OPPOSITE DIRECTION, giving ample discharge area with a short, snappy valve action. The movement of both members is short and rapid, discharging the sand in SMALL QUANTITIES but at FREQUENT INTERVALS. This action assures a deep sand-bed and a dry product.

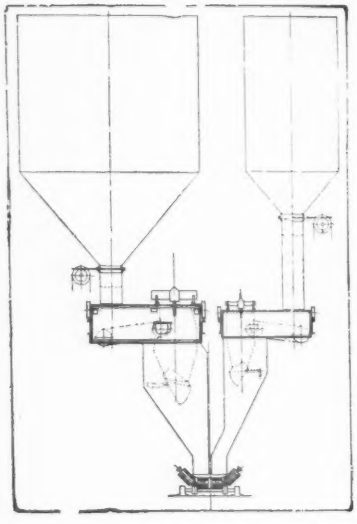
Careful tests under operating conditions show that Telsmith sand contains under 5 per cent free water and a total moisture content under 25 per cent. No other tank dewaters so thoroughly. Send for Bulletin No. ST-11.

SMITH ENGINEERING WORKS
3188 Locust Street Milwaukee, Wisconsin

Coal Fed to Boilers and Kilns in Lime Plants Automatically Checked Against Output of Lime

Secure Better Profits



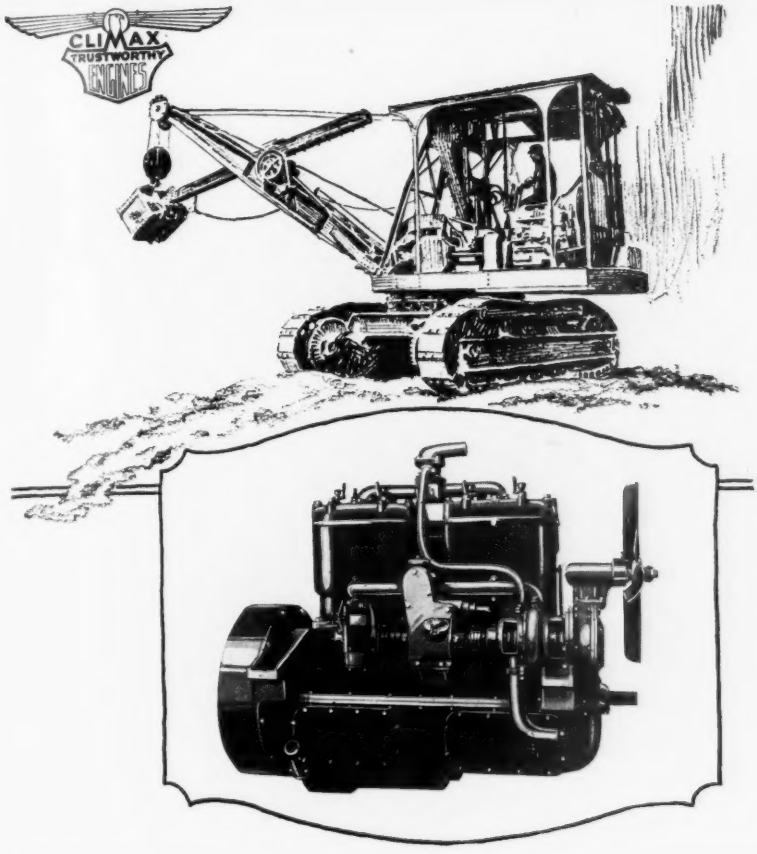


by Using

Richardson Apron Feed Automatic Scales

Production of finished lime checked against fuel charges helps to improve efficiency, eliminates waste and insures closer and more economical operating control.

RICHARDSON SCALE COMPANY, Passaic, N. J.
New York Chicago Boston San Francisco



Puts the "BIG BITE"

in the Bucket or Shovel

Cranes and Shovels Equipped With

CLIMAX

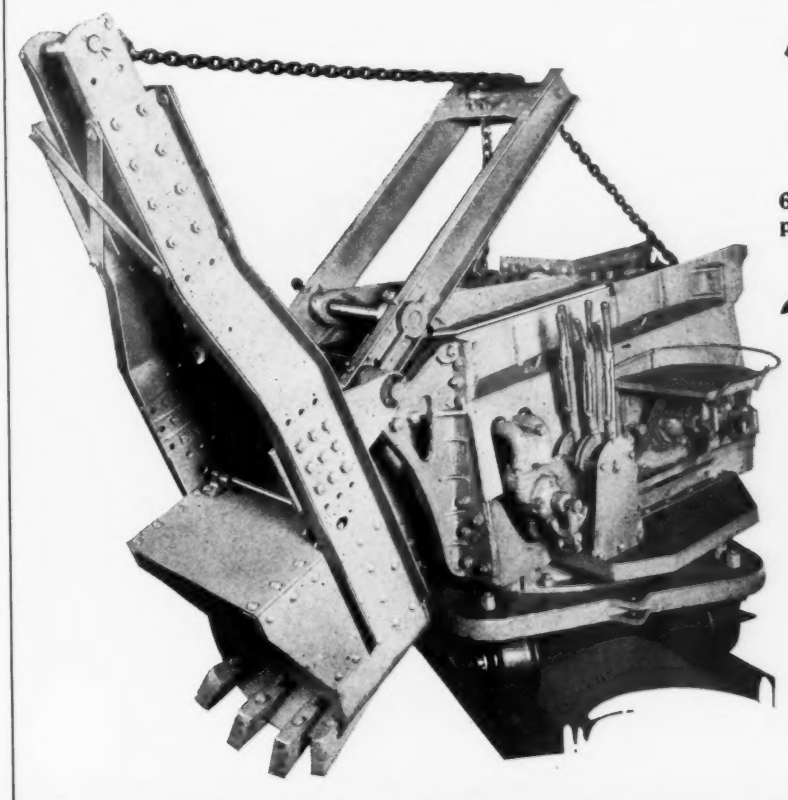
"The Trustworthy Engine"

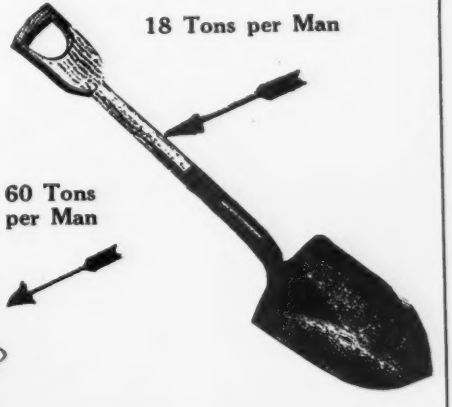
dig in deep, fast and sure. They never lack for power on any job. Used as standard equipment by—

Bay City Dredge Works, Bay City, Mich.; Byers Machine Co., Ravenna, Ohio; Victor R. Browning, Cleveland, Ohio; Link Belt Co., Chicago, Ill.; Locomotive Crane Co. of America, Champaign, Ill.; Moore Speedcrane, Inc., Chicago, Ill.; Northwest Engineering Co., Green Bay, Wis.; Orton & Steinbrenner, Huntington, Ind., and others.

Write for Catalog

Climax Engineering Company
22 W. 18th Ave., Clinton, Iowa





Simple—Is It Not?

Ask for details on how this may be accomplished at your mine.

Bulletin R103 on request

HOAR SHOVEL CO.
Duluth, Minn.

Where Only a Shay Will Do

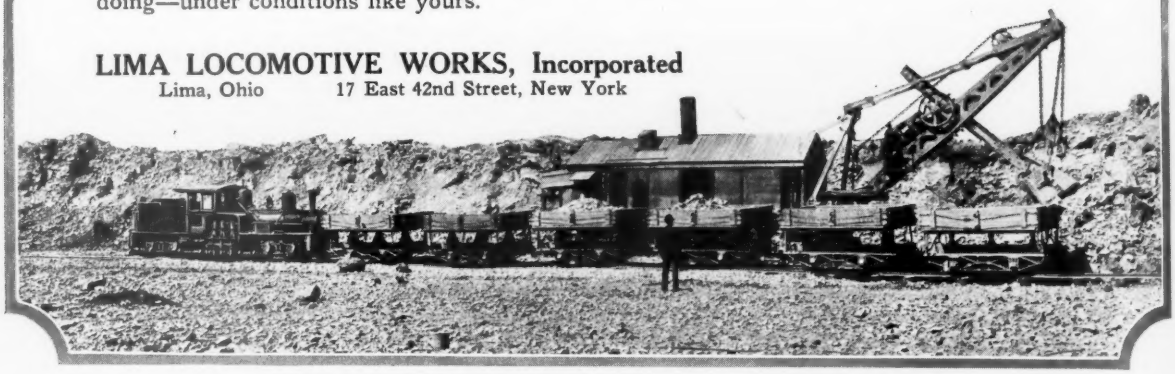
"We have been using Shay Geared Locomotives for the last seventeen years and have found them perfectly satisfactory in every way. ***I don't think anything but a Shay would have given the satisfaction we have enjoyed.***"

There are certain conditions under which no locomotive but a Shay can work satisfactorily—grades that are too steep, curves that are too sharp, or track that is too light or rough for the rod engine.

Tell us something of your transportation conditions, length of haul, grades, curves, etc., and we'll gladly tell you what the Shay is capable of doing—and is doing—under conditions like yours.

May we send you our latest catalog?

LIMA LOCOMOTIVE WORKS, Incorporated
Lima, Ohio 17 East 42nd Street, New York



VULCAN

Locomotives

A 12"x16" 25-ton standard gauge locomotive, equipped with steam brake, Automatic Couplers, owned by the Greenville Gravel Co., at the Mechanicsburg Gravel Pit. The Greenville Co. is operating a number of locomotives of this particular size and make.

The excess power built into every Vulcan Locomotive is the result of years of study and experience in the manufacture of locomotives for various industrial purposes.

Producers who keep accurate costs appreciate the service performances of these locomotives.

VULCAN IRON WORKS
Est. 1849
1753 Main Street Wilkes-Barre, Pa.

EASTON QUARRY CARS

TYPE 3563

EASTON CAR & CONSTRUCTION CO.

EASTON, PA.

SALES OFFICES

Hudson Terminal, New York
Morris Building, Philadelphia
Kunkel Building, Harrisburg
Jefferson Building, Birmingham
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Oliver Building, Pittsburgh
McKevitt Building, Norfolk
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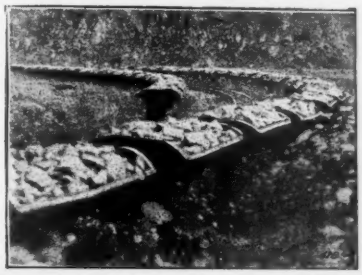
Bulletin 21

shows other types of quarry cars. Sent on request

"Quarry Car Practice"

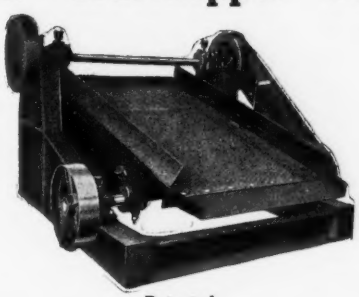
Published Every Now and Then

Part four is now being distributed. This issue contains over 50 illustrations of cars in actual service



EASTON INDUSTRIAL CARS

Robins "Grasshopper" Screen



Patented

$1350.00 F. O. B. Passaic, N. J.

The above price is for the standard screen equipped with a single deck. Furnished with a double deck, giving three sizes of product, for $210.00 additional.

It is ruggedly constructed.

Occupies small space.

Large capacity and small power consumption—5 H. P. required.

Absolutely free from vibration.
Write for Bulletin No. 58.

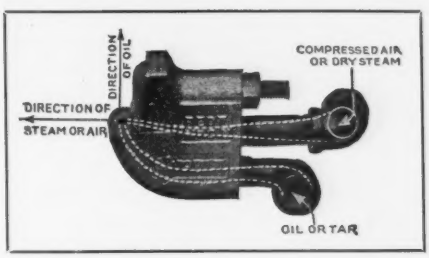
Robins Conveying Belt Company

New York Chicago Pittsburgh Boston

CALOREX

LIQUID FUEL EQUIPMENT

"Trade-Mark Registered U. S. Pat. Off."



The Calorex Liquid Fuel Equipment will increase the efficiency of your boiler, give you increased tonnage from your locomotive and can be used in lime or cement kilns with less trouble and less cost than the system you are now using.

Catalog and complete information on request

W. N. BEST CORP.

11 Broadway New York City, N. Y.

DAVENPORT LOCOMOTIVES

The use of the Davenport Locomotive enables you to speed up your plant when occasion demands. It will take care of your cars as fast as they can be loaded. An efficient, economical and durable locomotive.

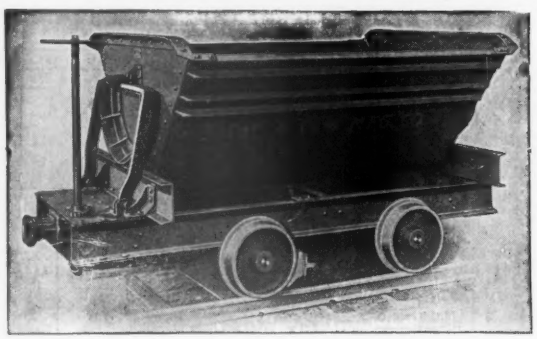
DAVENPORT LOCOMOTIVE WORKS
Davenport, Iowa

Baldwin Industrial Locomotives Meet Every Requirement

Our Industrial Locomotives are designed to meet special operating conditions. For this reason most satisfactory service is being rendered by Baldwin Locomotives used in plantations, quarries, lumber camps, in and around mines, on construction jobs and, in fact, wherever motive power is required.

There is a Baldwin Locomotive that will exactly meet your requirements, or we will design one that will be best fitted for your operating conditions.

The Baldwin Locomotive Works
Philadelphia



More Than Reinforced

Reinforcing a dump car makes it stronger, of course. But there is a best way to reinforce. Atlas cars are reinforced the best way. Why? Simply because we have built dump cars so long and for so many people that we know just where the reinforcing should go and just how it should be done.

Not much wonder, then, that Atlas dump cars stand the "gaff" better than the average.

The Atlas Car & Manufacturing Co.
ENGINEERS MANUFACTURERS
CLEVELAND, OHIO, U. S. A.

For 15 Years Our

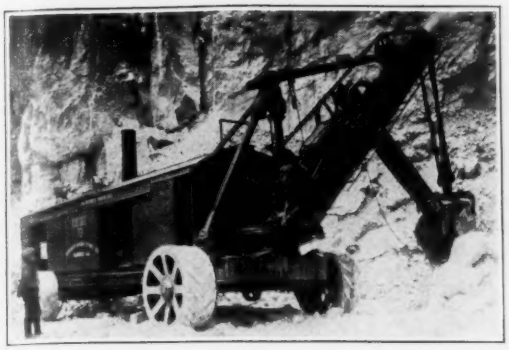
Industrial Crane

"Has been giving excellent service in stripping dirt off limestone and general work. Further, in being able to drop the bucket down into 12 or 15-foot cavities makes a saving of considerable money over hand labor."

So states Mr. H. W. Smith, General Plant Supt., Charles Warner Co., Devault, Pa., regarding their INDUSTRIAL purchased over 15 years ago and still giving excellent service.

Could you use an INDUSTRIAL in your operations? Let us mail you our Golden Anniversary catalog.

Industrial Works, Bay City, Michigan
New York Chicago Philadelphia Detroit
SALES ENGINEERS IN ALL PRINCIPAL CITIES
1873 BUILDERS OF CRANES FOR 50 YEARS 1923



OSGOOD 73—3½ yd. on Traction Wheels

Reliability—Service—Osgood

three words of great importance to the user or prospective user of Steam Shovels. OSGOOD Steam Shovels are built reliable—right in our own factory—to give long and satisfactory service in the field.

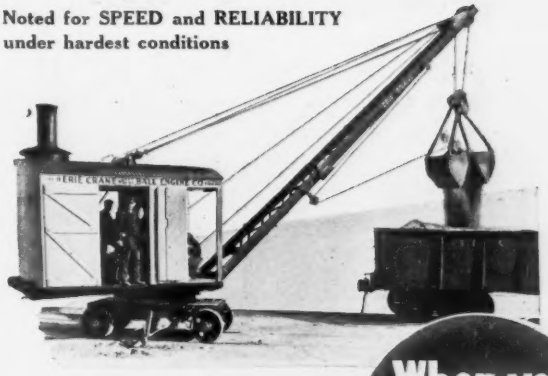
An OSGOOD can only be fully appreciated after it has been seen. Watch one at work. Our new Bulletin 231 will tell you more about them.

¾, 1 and 1¼ yd. Revolving type Steam Shovels, Clamshells, Draglines

1½ to 6 yd. Railroad type Steam Shovels

The OSGOOD Company
Marion, Ohio

Noted for SPEED and RELIABILITY under hardest conditions



When you need extra output

This machine saves you money even when it is working at only one-fourth capacity, and replacing only 10 or 12 men—

And when you have ***rush orders*** and are working your plant to the limit, your **ERIE** Crane can give results like these:

"We loaded 300 tons of sand in 2 hrs. and 10 mins., digging 3 to 8 ft. below track level. This time included moving from car to car.

"This is too speedy, but we wanted to know what our ERIE Crane can do."—W. B. Manny, President, Hoosier Slide Sand Co., Michigan City, Ind.

Every ERIE Crane can be quickly and easily changed to steam shovel.

Let us send full description of the ERIE Crane. Write for Bulletin P-30.

Erie Steam Shovel Co., Erie Pa., U. S. A.
Builders of ERIE Steam Shovels and Locomotive Cranes

ERIE Revolving Shovels

Flirting With the Shovels

In the game of crushed stone quarrying a drill that is within flirting distance with steam shovel or the loading gangs is in a dangerous position. A breakdown on the drill, and the whole production schedule is upset.

No. 14 Cyclone Drills, on the job, always keep plenty of stone ahead, and if they should ever be crowded there is no need for worry—the working parts are cast steel, reducing to the very minimum all possibility of breakdowns.

Write for "Big Blast Hole Drills," a semi-technical treatise on quarry drilling and also containing a complete description of Cyclone No. 14 Big Blast Hole Drills.

The Sanderson-Cyclone Drill Co.
Orrville, Ohio

Eastern and Export Office: **30 Church Street, New York City**

Bucyrus Electric Shovels

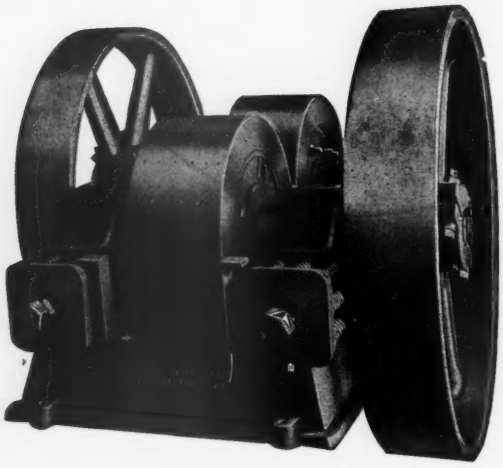
Represent the most efficient application of electric power to excavating machinery known today.

General Electric D. C. Ward Leonard Generator Field Control—generally proven the most flexible and economical for large revolving shovels and heavy-duty railroad-type shovels. Magnetic, rheostatic control A. C. equipment is also supplied where power conditions warrant.

Whatever Your Power Requirements There Is a Bucyrus Adapted to Your Conditions

BUCYRUS

Bucyrus Company, South Milwaukee, Wis.
504



CRUSHERS—

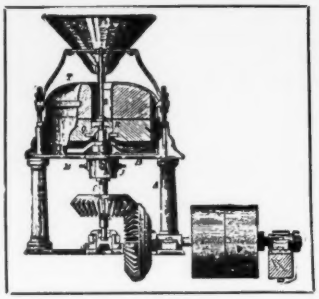
Webb City & Carterville crushers, screens, elevator buckets, or transmission equipment have conspicuously demonstrated their superiority wherever they have been installed.

Write for Descriptive Circular

WEBB CITY & CARTERVILLE FOUNDRY & MACHINE WORKS
WEBB CITY, MISSOURI

Do You Do Fine Grinding?

THE Munson Underrunner Buhr Mill has stood the test of time and is still first choice with a large number of concerns whose product demands fine, uniform grinding.



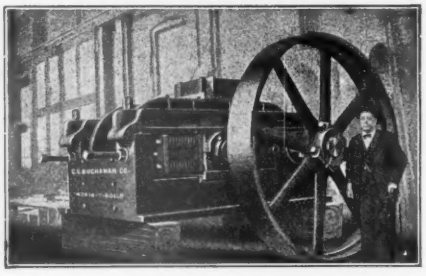
This mill is particularly well adapted for grinding limestone, gypsum, hematite ores, slate and similar materials, though in actual service is is used on a much wider variety of products.

Send us a sample of the material you wish ground so that we may tell you the possibilities of the "MUNSON."

Catalog No. 71 tells more about these mills.

Munson Mill Machinery Co., Inc.
Est. 1825 Utica, N. Y.

BUCHANAN CRUSHING ROLLS

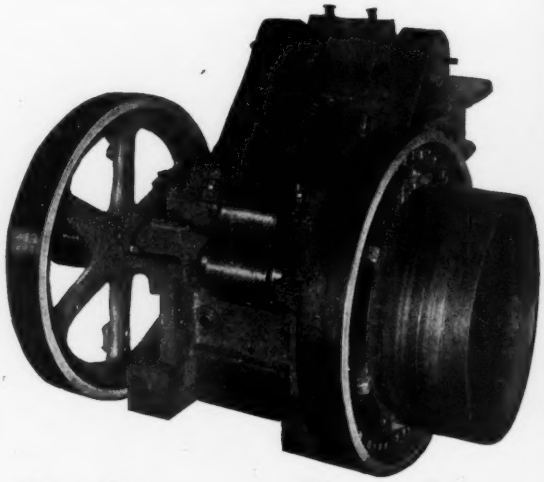


Type "C" Buchanan Box Bed Crushing Rolls for Heavy Duty Bulletin No. 13

Years of manufacturing experience, combined with an intimate knowledge of the conditions under which such machines operate, assures the purchaser of Buchanan Equipment machines of remarkable durability.

COMPLETE CRUSHING PLANTS

C. G. BUCHANAN CO., Inc.
Cedar and West Streets NEW YORK CITY



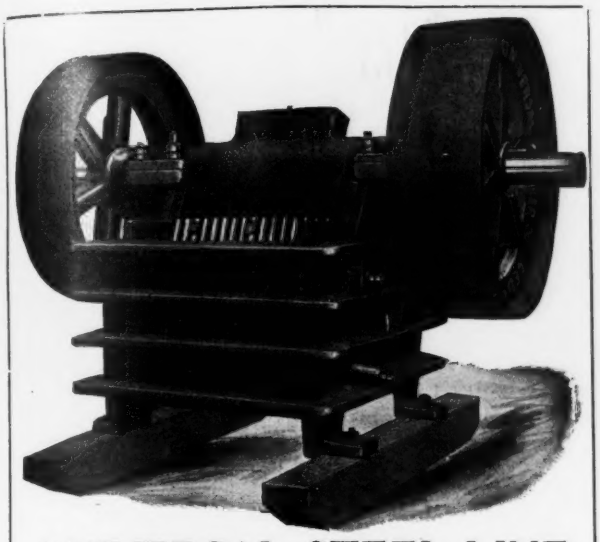
Reliance Crushers

IN ALL SIZES FOR EITHER PORTABLE PLANTS FOR ROAD BUILDING OR STATIONARY QUARRY INSTALLATIONS.

BUILT FOR LONG, HARD SERVICE—WILL SAVE YOU MONEY IN THE LONG RUN

Let us quote you prices

Universal Road Machinery Co., Kingston, N. Y.
Branches in all principal cities in U. S. and Canada
MANUFACTURERS OF THE FAMOUS RELIANCE LINE OF ROAD BUILDING AND QUARRY EQUIPMENT



UNIVERSAL STEEL LINE

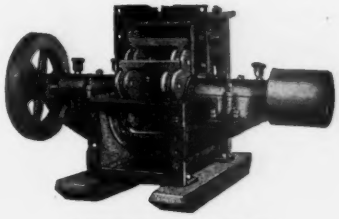
THE PERFECT GRAVEL AND REJECTION CRUSHER

Sizes up to 8"x36". Capacities 20 to 200 tons daily. Crushes to ¾" and finer if desired. Has no superior for FINE CRUSHING and UNIFORMITY of product.

STRONG LIGHT DURABLE ECONOMICAL

UNIVERSAL CRUSHER CO.

225 Third Street Cedar Rapids, Iowa, U. S. A.



Manganese Steel Linings

USERS OF "K-B" PULVERIZERS

requiring additional tonnage are ordering "K-B" equipment.

May we tell you why?

K-B PULVERIZER

K-B Pulverizer Co., Inc.
92 Lafayette Street
New York

YORK LIME KILNS

Special Kilns For Special Purposes

We also manufacture:
Dryers
Hydrators
Gas Producers
Rotary Screens
Tanks
Grey Iron Castings
Special Machinery from Engineers' Designs

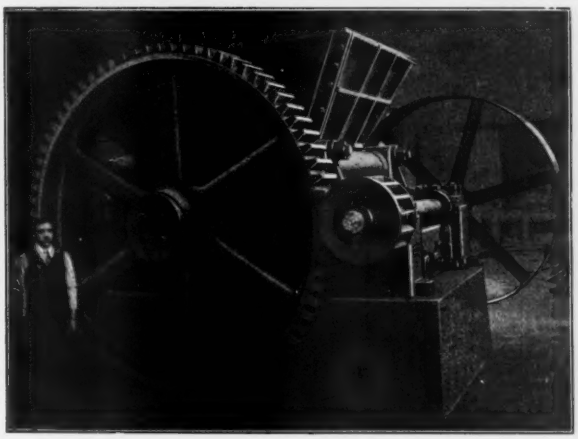
Keeping up with progress in the lime industry does not necessarily mean the scrapping of your present plant.

We fit our modern kilns between old-style kilns so as not to conflict with old plant arrangements. In keeping with this idea, we are modernizing the plant of the Cheshire Lime Co., Cheshire, Mass., in just this way.

Working in co-operation with the foremost lime and hydrating engineers in the country enables us to achieve efficiency and economy.

McGann Manufacturing Company, Inc.
Works, York, Pa.

332 S. Michigan Ave., Chicago 50 Church St., New York



If you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher, you would now be running only the McLanahan Crushers.

After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

McLanahan-Stone Machine Co.
Hollidaysburg, Pa.

Screens, Elevators, Conveyors, Rock Washers, Etc.

The Kritzer Continuous Lime Hydrator

HYDRATE

Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

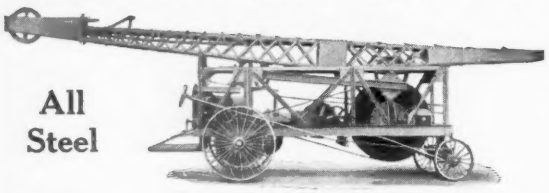
THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

THE KRITZER COMPANY

503 South Jefferson Street CHICAGO, ILL.

The ARMSTRONG



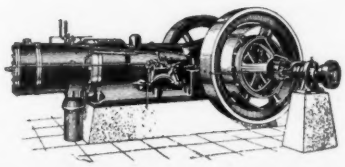
All Steel

BLAST HOLE DRILL

—has a clutch that works. It takes hold when you start the machine in the morning and it holds till you quit at night. It does its part every hour in the day every day in the year. And **it is guaranteed against breakage from any cause during the life of the machine,** and that is a long time because the machine is All Steel. It ends clutch troubles. No breaks to delay your work—no idle time from clutch troubles. It is the greatest boon to operators that was ever put on a drilling rig. Write for our complete catalog. It's FREE. Write today.

Armstrong Manufacturing Company

310 Chestnut Street, Waterloo, Iowa, U. S. A.



THERE IS A REASON!

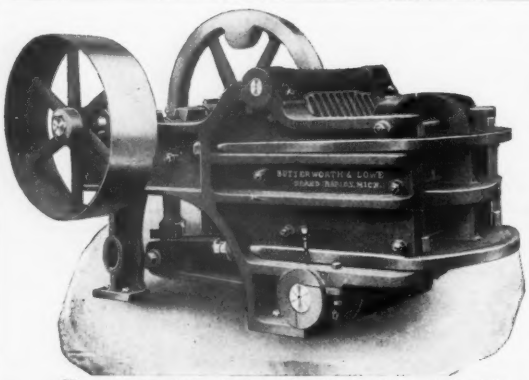
There must be some explanation for the preference Pit and Quarry men show toward the PRIMM Oil Engine. There is always a reason for such popularity. This growing tendency toward PRIMM is due largely to its ruggedness and its day in and day out dependability--the PRIMM is also entirely dust proof.

THE POWER MFG. CO.

705 Cheney Ave.

MARION, OHIO

PRIMM Oil Engines



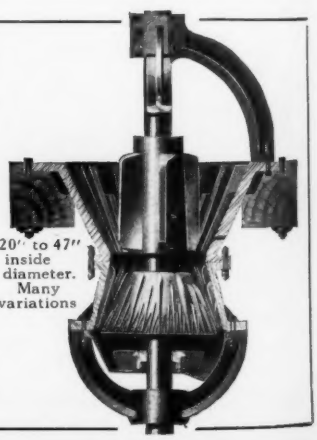
Nippers—17x19", 18x26", 20x30",24x36" and 26x42"

JAW & ROTARY CRUSHERS

For All Rocks and Ores Softer Than Granite

GYPSUM MACHINERY—We design modern Plaster Mills and make all necessary Machinery, including Kettles, Nippers, Crackers, Buhrs, Screens, Elevators, Shafting, etc.

Special Crusher-Grinders for Lime



20" to 47" inside diameter. Many variations

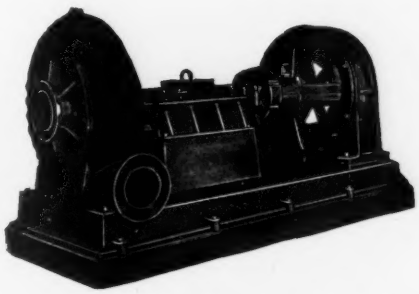
Butterworth & Lowe

17 Huron St. Grand Rapids, Mich.

J. C. BUCKBEE COMPANY
Engineers *and* Contractors
CHICAGO, ILL.

Design and build cement plants, rock crushing plants, power plants and industrial structures.

Examinations, Reports and Valuations of Industrial Properties



Heavy Service Dredging Pump

Where conditions are too severe for our standard sand pump, the above type is recommended.

It is built in sizes from 4 in. up, arranged for belt, motor, or engine drive.

MORRIS MACHINE WORKS
50 Genesee St. Baldwinsville, N. Y.

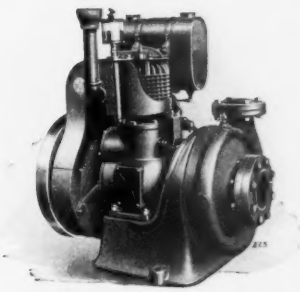
39 Cortlandt St., New York City
Forrest Bldg., Philadelphia, Pa.
217 N. Jefferson St., Chicago, Ill.
Penobscot Bldg., Detroit, Mich.

Bulletin No. 19-B fully describes our complete line of sand and dredging pumps. Have you your copy?

MORRIS

Since the Civil War Builders of Centrifugal Pumps, Hydraulic Dredges, and Steam Engines

PENNSYLVANIA



The PENWAY PUMPER

a light, convenient gasoline-kerosene driven pump of large capacity for quarry work.

We also build a full line of Centrifugal Pumps and Air Compressors

PENNSYLVANIA
PUMP AND COMPRESSOR COMPANY

MAIN OFFICES AND WORKS EASTON, PA.

BRANCH OFFICES:
325 Penfield Building, Philadelphia, Pa.
30 Church Street, New York City.
105 West Monroe Street, Chicago, Ill.

Fig. 283. Sand and Gravel Dredge

HYDRAULIC DREDGES
SAND and GRAVEL DREDGES
DREDGING PUMPS and MACHINERY

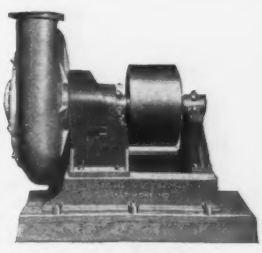


Fig. 280. Dredging Pump

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Ellicott Machine Corporation, Baltimore, Maryland, U. S. A.

MANGANESE
THE FIRST ERA STILL LEADS IN QUALITY
STEEL
THE HADFIELD-PENFIELD STEEL COMPANY
BUCYRUS, OHIO

Deliver on Time

Era Manganese Steel Repair Parts are built up on the kind and degree of unfailing reliability that is peculiarly its own. Today the owner of these parts may call upon his machinery only for the ordinary daily routine and tomorrow with the same reliance he can call for greater and greater production in order to deliver on time, and he will for these parts are ready and willing to do their share.

Let us know of your needs.

The Hadfield-Penfield Steel Company
Bucyrus, Ohio

ROBERT W. HUNT CO.
Inspection—Tests—Consultation

Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

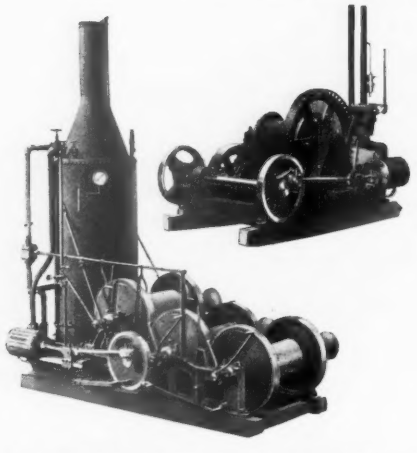
Cement, Chemical and Physical Testing Laboratories

CHICAGO
New York 2200 Insurance Exchange Pittsburgh
St. Louis Kansas City Cincinnati San Francisco

Scientifically Designed Equipment

Zepp Automatic Hydrator
Meade Improved Lime Kilns
Complete Lime, Cement and Plaster Plants
Efficiency of Operation—Low First Cost

RICHARD K. MEADE & CO.
Chemical and Industrial Engineers
11 E. Fayette St. Baltimore, Md.

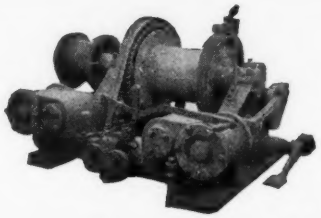


The "AMERICAN" Heavy Duty Clamshell Derrick Engine is a Profit Builder

When you buy a clamshell derrick hoist the big thing to be sure of is ample capacity. There will be no question about this if you buy an "AMERICAN" Heavy Duty Clamshell Derrick Engine—9x10 size for a 1½-yard bucket; 10x12 size for a 2-yard bucket—and an "AMERICAN" 5x7 or 7x8 Independent Slewing Engine.

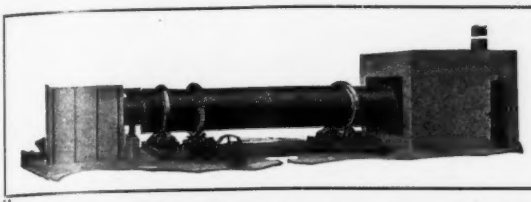
AMERICAN
HOIST & DERRICK CO.
Saint Paul, Minn.
New York - Chicago - Pittsburgh - Seattle - New Orleans - Detroit

FOR SALE



Emerson-Brantingham Hoists
UNUSED
DOUBLE CYLINDER, SINGLE DRUM, IN FIRST CLASS CONDITION
$125.00 Each F. O. B. Chicago
Capacity, 10,000 Pounds
IMMEDIATE SHIPMENT
Detailed Specifications Furnished on Application
"QUANTITY IS LIMITED"
Relaying rails and angle bars, all weights and tonnages, for prompt shipment. Get our quotations

HYMAN-MICHAELS CO
531 Peoples Gas Bldg., Chicago, Ill.



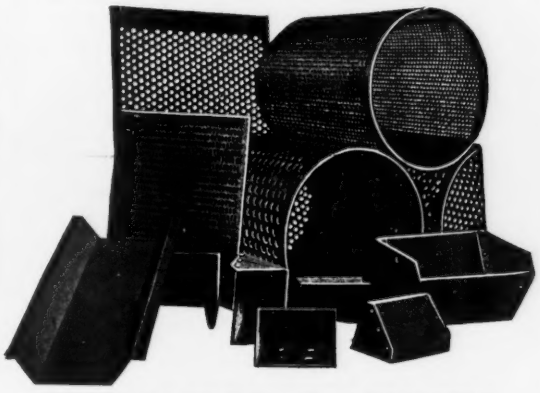
We Build Our Dryers to Suit Your Requirements

Buckeye dependability has been demonstrated over a long period of time, dependability not only in long unimpaired service of the Buckeye Dryer, but also in the Buckeye organization.

This fact is largely due to our method of building dryers to fit the conditions existing at your plant. Every dryer we ship is designed and constructed to meet the most exacting requirements of a particular plant, and because of this we feel justified in claiming the Buckeye is the most efficient dryer on the market.

THE BUCKEYE DRYER COMPANY, 131 West Lake Street, Chicago, Ill.

Perforated Metal Screens
FOR
Stone, Gravel, Sand, Etc.

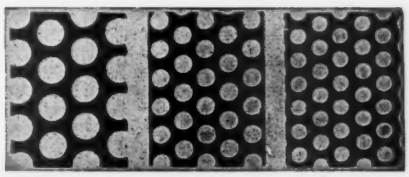


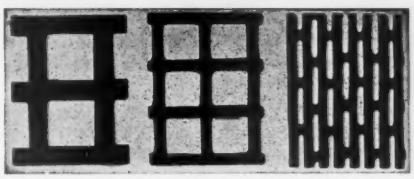
ELEVATOR BUCKETS
PLAIN AND PERFORATED

General Sheet and Light Structural Work
"Light and Heavy Steel Plate Construction"

HENDRICK MFG. CO.
CARBONDALE, PA.
New York Office, 30 Church Street
Pittsburgh Office, 544 Union Trust Bldg.
Hazleton, Pennsylvania, Office, 705 Markle Bank Bldg.

Perforated Steel Screens





For Screening Stone, Gravel, Sand and Cement

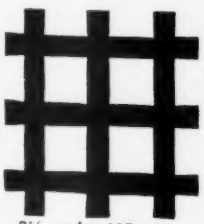
All sizes and shapes of holes in metal of proper thicknesses to give the best screening results.

Sheets furnished flat or rolled to shape for revolving screens.

THE HARRINGTON & KING PERFORATING CO.

621 N. Union Ave., Chicago, Ill.
NEW YORK OFFICE: 114 Liberty St.

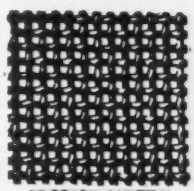
"CLEVELAND" DOUBLE CRIMPED WIRE CLOTH



2½ mesh; .105 wire

A uniform fineness is assured by the use of "Cleveland" Double Crimped Wire Cloth, making it unequalled for the screening of Sand, Gravel, Crushed Stone and Cement. "Service" is the definite policy of this organization, and through every phase of manufacture this end is constantly before us.

A large stock always on hand. However, any special mesh will be manufactured to suit requirements. PRICES RIGHT



18 Mesh: .047 Wire

THE CLEVELAND WIRE CLOTH AND MANUFACTURING COMPANY

3573 East 78th Street **Cleveland, Ohio**

SPEND A LITTLE MONEY
and save much
Your rising hauling costs will be ended by installing an
AUTOMATIC AERIAL TRAMWAY
We Can Show You
Interstate Equipment Corporation
25 Church Street, New York City

Chicago Office: Railway Exchange Bldg. New York: 30 Church St.

Get a Practical Crane

Furnished in mounting and power to suit requirements of buyer.

BOOM can be raised or lowered under load while operating—this is one of the practical features, exclusive with Byers.
Write us for interesting bulletins.

BYERS *Model 10*
Full Circle Crane
Also Auto-Cranes, Truckranes, Buckets, Hoists, etc.
THE BYERS MACHINE COMPANY, 310 Sycamore St., Ravenna, O.

KNOX
Valves-Couplings-Nipples-Clamps-Menders

Knox Valves and Couplings are as good as money can buy, and they cost less. They cannot leak under the highest working pressure, they cannot injure your hose, and rough handling will not injure them.

"Better Valves and Couplings for Less Money"

The Knox Mfg. Co., 821 Cherry St., Philadelphia, Pa.

O.S.
DEPENDABLE
Cranes

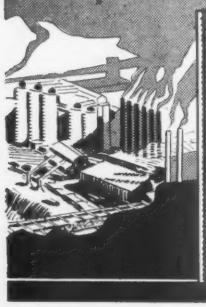
Every user in the land will verify our claims that the O. S. Dependable crane is as nearly faultless as it is humanly possible to make a machine.

It does the work cheaper and quicker. Equipped with various devices for handling materials.

Write for catalogs No. 23-24.

ORTON & STEINBRENNER
608 South Dearborn Street
Factory: Huntington, Ind.

SIL-O-CEL
PREVENTS HEAT PENETRATION



Heat Insulation
for Cement Kilns and Waste Heat Boilers

Sil-O-Cel Insulation possesses a lower heat conductivity than any other known material and will withstand extremely high temperatures. Furnished in convenient forms for easy application.

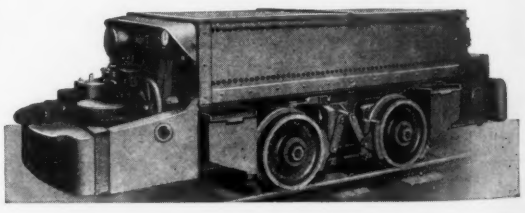
Detailed information and blueprints sent upon request. Write for Bulletin S-95.

CELITE PRODUCTS COMPANY
New York-11 Broadway Chicago-53 W. Jackson Blvd. San Francisco-Monadnock Bldg.
CELITE PRODUCTS LIMITED, New Birks Bldg., Montreal, Canada.
OFFICES AND WAREHOUSES IN PRINCIPAL CITIES

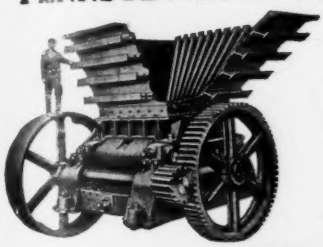
THE **IRONTON**
STORAGE BATTERY LOCOMOTIVE

Efficient, economical hauling. Find out about storage battery locomotives for your hauling. The Ironton is the best storage battery locomotive.

The Ironton Engine Co.
Ironton, Ohio



"PENNSYLVANIA" Single Roll Crusher



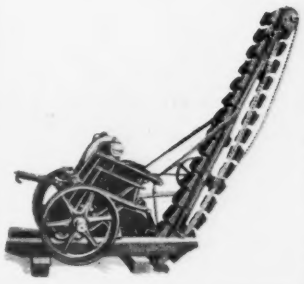
The New Series of "Pennsylvania" Single Roll Crushers take steam-shovel feed of limestone, cement rock, gypsum and similar materials, — wet and sticky, — without feeder, and make maximum reduction in one operation. All parts readily accessible. Maintenance cost lower per ton than for any other type. Massive construction — Reliable Safety Devices — Convenient adjustment. Capacities 5 to 450 tons hourly.

Put Your Reduction Problems Up to Us

PENNSYLVANIA CRUSHER COMPANY
Stephen Girard Bldg., Philadelphia

New York
Pittsburgh

New Holland Rock Crusher



Excellent for crushing oversize rock into fine grades. Will take the oversize output of a larger crusher and reduce it to smaller sizes that bring a higher price. A New Holland Crusher is inexpensive and will increase your profits from crushed rock.

New Holland Rock Crushers are made in sizes to handle 5 to 15 tons per hour, requiring 5 to 12 h. p. to operate.

Write for descriptive literature, stating what your general requirements are

New Holland Machine Co., New Holland, Pa., U.S.A.

FULLER PRODUCTS
Insure Fullest Satisfaction

Crushing Rolls.
Pulverizer Mills.
Direct and Indirect Fired Dryers.
Ball and Tube Mill Liners and Partition Plates.
Fuller-Kinyon System for Conveying Pulverized Materials.
Sprockets, Traction Wheels, and Roll Heads.
All kinds of High Grade Chilled Charcoal Iron Castings for All Uses.

Ask for catalogue and prices

FULLER-LEHIGH COMPANY
Fullerton, Pa., U. S. A.

Quality and Service Always—

We manufacture screens in any desired wire material, in any style, or size of mesh. Uniform Double Crimped sand and gravel screens. Heavy screens for crushed stone. A large stock of galvanized wire cloth and fine mesh in either steel, copper or brass always on hand. "Everwearing" spring steel screens are practically indestructible

Send for circular—prices always right

TWIN CITY IRON AND WIRE COMPANY
St. Paul, Minn.

McMYLER-
buckets
clam-shell and orange peel

Locomotive Cranes - Bridge Cranes
Equipment for Moving Materials

THE McMYLER-INTERSTATE CO.
CLEVELAND

INTERSTATE

CROSS ENGINEERING CO. CARBONDALE, PA. PERFORATED SHEET METALS

Our screens produce a product clean and perfectly sized.

We can supply repair and renewal parts quickly and correctly. Rush orders can be filled promptly because of our stock of 500 tons or more of steel plates.

Cross Engineering Company
Offices and Works:
Carbondale, Pa.

We Look Into the Earth

By using Diamond Core Drills. We drill for Limestone, Gypsum, Talc, Fire Clay, Coal and all minerals.

We are fully equipped for testing foundations for bridges, dams, buildings, and all work of a similar character.

PENNSYLVANIA DRILLING CO.
Drilling Contractors
Pittsburgh, Pa.

AJAX
BULL BEARING ALLOY

"Better than Babbitt"

Ajax Bull Bearing Alloy in your crusher bearings prevents frequent re-babbitting and is a safeguard against costly breakdowns. We'll prove it.

Send for circular A and our offer.

The Ajax Metal Company, Philadelphia
Established 1880
New York Chicago Boston Cleveland

ANCHOR BRAND COLORS

For Mortar, Cement and Brick—Brown, Black, Red and Buff —Strongest and Most Durable

Manufactured by

C. K. Williams & Co.

Correspondence Solicited EASTON, PA., U. S. A.

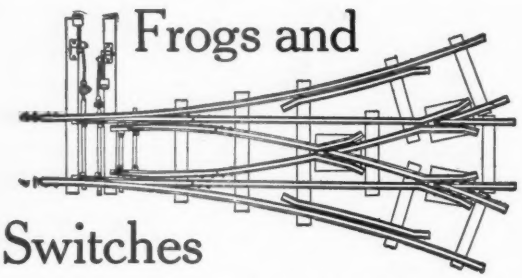
EMERSON STEAM PUMPS

For nearly twenty-five years they have stood the "gaff" of hard, rough usage, giving to contractors, mine and quarry operators steady, unfailing service. The test of time has proved their worth.

Emerson Foot Valves Add Efficiency to any pump.

Write for full information

The Emerson Pump and Valve Co., Inc.
Alexandria, Va.



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The Central Frog & Switch Co., Cincinnati, O.

Frogs, Switches, Crossings, Switch Stands, Rails, Angle Bars, Fish Plates, Throws, Rail Braces, Tie Plates, Portable Track, Etc., Etc.

The Morgan Producer Gas Machine

is the highest class gas producer built in the U. S. and is advertised in this journal the second issue of each month.

Morgan Construction Company
Worcester, Mass.

W. D. Mount, 601 Peoples National Bank Bldg., Lynchburg, Va., Representative in the Lime Industry

REPEAT orders indicate satisfied customers. That's why we are proud of the fact that a large percentage of our sales are to people who are already operating Sauerman Cableways. One large sand and gravel company has seven of our machines installed at their different plants. If you wish to know why our equipment is so popular, send for Pamphlet No. 17.
SAUERMAN BROS.
430 South Clinton Street Chicago
SAUERMAN DRAGLINE CABLEWAY EXCAVATORS
dig, convey, elevate and dump in one operation

CRESCENT BELT FASTENERS
They Insure Full Power Transmission
They Sustain the Belt's Full Strength
They Make Good Belts give Better Service
CRESCENT BELT FASTENER CO.
381 FOURTH AVE., NEW YORK.

KEEP UP WITH THE ROCK PRODUCTS INDUSTRY

TIME and money are saved and won by keeping up with the progress of industry. Changing conditions, methods, prices must be reckoned with to win success. **Rock Products** is the authoritative source of business and technical information in the rock products industry. It is edited from the field by experienced practical men.

Subscribe now and get in correspondence with **our** service and advisory departments.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Type ads only. No cuts or illustrations permitted unless at the regular display advertising rates. Please send check with order. These ads must be paid for in advance of insertion

FOR SALE

We have sufficient 8-foot shell, in five pieces, to make 150-foot Rotary Kiln, 4 steel tires, and 4 sets of Carrying Rolls, but no Driving Mechanism. If you so desire we can send you detailed description of this Equipment.

1—No. 10 Allis-Chalmers Gyratory Crusher, Manganese Fitted.
1—No. 60 Kennedy-Van Saun Gyratory Crusher.
3—No. 6 McCully Gyratory Crushers, Manganese Fitted.
2—No. 5 Allis-Chalmers Gyratory Crushers.

The Equipment Sales Company
R. W. Storrs, Jr., Manager
Nashville Tennessee

Wire us your requirements at our expense.
"If we don't have it, we will get it."

Mine Cars, Rails and Locomotives
We have a number of good, serviceable, standard gauge, second hand locomotives, and narrow gauged ones, for immediate shipment.
M. K. FRANK
Frick Building Pittsburgh, Pa.

For Sale—Steam Shovels
1—70 C. Bucyrus, 2½ yd. Bucket.
1—60 Marion, 2½ yd. Bucket.
Both standard gauge. Immediate shipment.
Consolidated Products Co., Inc.
15 Park Row New York, N. Y.

Wanted—Steam Shovel
About 1 yd. dipper, traction or caterpillar. Consider purchase. Must be first class condition, and bargain price, otherwise not interested. Submit complete specifications.
International Silica Company
Cairo, Ill.

FOR SALE
No. 20 Traylor Bulldog Gyratory Crusher
7½D—Gates Gyratory Crusher
No. 10 McCully Gyratory Crusher
48"x20' Revolving Manganese Screen.
ARTHUR S. PARTRIDGE
415 Pine St. Louis

WANTED
1—½ yd. Dragline Bucket.
Breen Stone & Marble Co.
Kasota, Minn.

FOR SALE
One new 6 ft. x 6 ft. x 10 ft. Patch Gang Saw, complete with pump.
Address Box 1677, care of Rock Products
542 South Dearborn St., Chicago, Illinois

3—6x24 ft. Heavy Duty Tube Mills, silex lining, unused.
Address
Box 1680, care of Rock Products
542 S. Dearborn St., Chicago, Ill.

FOR SALE
4000 lin. ft., 30-in., 20 lb. Track
12 30-in., 1½-yd. Cars
PLYMOUTH GASOLINE LOCOMOTIVE
F. WILLIAM STOCKER
Hoboken, N. J.

For Sale—STEAM SHOVEL
⅝ YD. THEW "O" TRACTION
Thoroughly rebuilt; attractive terms for quick sale.
Walter A. Zelnicker Supply Co., St. Louis
Rails, Locomotives, Cars, Tanks, Pipe

Used Equipment

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FOR SALE

5 5x6x7x110′ Rotary KILNS.
5 5x21′ Tube Mills (1 has Silax Lining, 3 Steel Lining, 1 without Lining).
2 No. 8 Ball Mills.
1 4x40′ Coal Dryer.
1 No. 6 Gates Crusher.
2 5½x22′ Smidth Tube Mills.
2 No. 66 Smidth Kominuters.
2 6x60′ Rotary Dryers.
1 Lathe, 26″ Swing, 16′ Bed.
2 Automatic Weighing Machines.
3 Roll Leather Belting, 3-ply, 46″x 242′. And lot of Miscellaneous Equipment.

ENGINEERING SALES COMPANY
Stockertown, Pa.

FOR SALE

1—6K Gates Crusher
1—4B Gates Crusher
15—4½ to 5 ton steel body, end dump, heavy duty standard gauge quarry cars, new, 1922
1—Switching Locomotive, standard gauge
1—70 ton Steam Shovel, 2½ yd. bucket
Will sell any or all at very low prices

Inland Crushed Stone Co.
105 North Clark St. Chicago, Ill.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25′, 3½ x25′, 4x30′, 5½x50′, 6x60′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers, 4x30′ and 6x30′.

KILNS—Rotary kilns, 4x40′, 5x50′ and 6x70′, 6x100′, 7x80′ and 8x110′.

MILLS—6x8′, 6x5′, 5x4′, 3x3½′ pebble and ball mills; 3′ March mill; 42″, 33″ and 24″ Fuller-Lehigh mills; 4½x20′, 5x11′, 5x20′, 5½x22′ and 6x20′ tube mills; 7½x13″, 9x15″, 16x10″ and 12x26″ jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24″, 36″ and 40″ cage mills; 3′ and 4½′, 6′ and 8′ Hardinge mills; 18x12″, 20x12″ and 30x10″ roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36″ Sturtevant emery mill; one 3 roll Griffin mill; 60″ chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8′, 6x5′ and 4x3′ Newaygo vibrating screens; Richardson automatic scales; 8′ and 10′ Emerick air separators.

Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

1—50-ton standard gauge Brooks 6-wheel switcher.
1—28-ton standard gauge Shay geared locomotive.
2—10x16″ 36″ gauge 4-wheel saddle tank locomotives.
2—9x14″ 36″ gauge 4-wheel saddle tank locomotives.
1—14-B Bucyrus steam shovel, mounted on traction wheels.
2—18-ton O&S bucket handling locomotive cranes.
10 Miles 30-lb. and 35-lb. relay steel rails, Natalbany, La.

Birmingham Rail and Locomotive Co.
Birmingham, Ala.

SPECIAL BARGAINS
Send Us Your Boiler Inquiries

66x86 in. TRAYLOR JAW CRUSHING PLANT.
25-50-80-110 HP. Elec. Hoists.
Nos. 4-5-6-7½-9 and 10 CRUSHERS.
6 and 10 ton Gasoline Locomotives.
2-DISC CRUSHERS, 24, 28 and 36 in.
100 TON 2½ yd. ELECTRIC SHOVEL.
50-5000 ft. Steam Belt and Electric Compressors.
13x30 in.; 10x18 in.; 8x14 in. JAW CRUSHERS.
24x54 McLANAHAN ROLL CRUSHERS.
50 HP. D. D. HOIST, 440 V. 3 Ph. Motor Dragline Set; Also 25 HP. Dragline Equip.
150 HP. LOCO. TYPE BOILER, 125 lb.
3 60-HP. GASOLENE S-D HOISTS, PRAC. NEW.
10 and 12 ton ROAD ROLLERS.
5-7½ and 10 HP. PORTABLE CONVEYORS.
750-1000 GPM. UNDERWRITERS STEAM PUMPS.
NEW No. 5 GYRATORY CRUSHER (MICHIGAN).

Send Us Your Inquiries for Your Wants
ROSS POWER EQUIP. COMPANY
Indianapolis, Ind.

Take advantage of the Opportunity offered in the Used Equipment Department to dispose of the equipment that you no longer need.

Classified Advertising

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STONE LAND FOR SALE OR LEASE

Over 400 acres of fine white limestone, light stripping, and nearly all covered with fine black dirt. 1,160 ft. of R. R. frontage on the Indiana Harbor Belt Railway. High tension wires of 33,000 volts extend the full length of this property supplying all power and light necessary. Twelve miles from loop in Chicago. Fine stone roads for autos or trucks to all parts of the city.

H. A. STODDARD
R. F. D. ROUTE 2 PHONE LA GRANGE 548 LA GRANGE, ILL.

POSITION WANTED

An experienced cement manufacturer, technically and commercially trained in all details of financing, operating and selling, desires suitable connection. If interested full information will be furnished.

Address P. M. 200, care Rock Products
542 South Dearborn Street Chicago, Illinois

FOR SALE

Complete sand and gravel plant. Present capacity four hundred tons per day. An ideal deposit, excellent in quality, deep, and forty acres in extent. Railroad and trucking deliveries. Address

Box 1683, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

Executive position desired with cement or allied industry as manager, works manager or supt., by an experienced cement man. Chemical engineer with ten years' American and seven years' foreign experience. Ready to take immediate charge of both types of plants or other works controlling engineering, construction and operation work and certain to give satisfactory results. Will arrange conference in reply to letter or wire to Rock Products.

Address Box 1693 care Rock Products
542 South Dearborn Street Chicago, Illinois

Position Wanted

as Manager, General Superintendent or other position of responsibility. Long, practical experience with large operations in both construction and operation. Intimate acquaintance with most types of machinery, both plant and quarry. Good mechanical and executive ability. Address

Box 1681, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

Experienced Manager

Open pit or underground quarry superintendent or manager open for employment August 1. Fifteen years' experience. Best references. Nominal salary with share in profits produced.

Address Box 1678, care of Rock Products
542 South Dearborn Street Chicago, Illinois

WANTED

Superintendent for large rock drying and grinding plant in South. Prefer mechanical engineer experienced in operation of modern drying equipment. Apply with full particulars.

Box 1694, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

POSITION WANTED

Cement plant engineer, as general manager or general superintendent of cement plant or plants. Wet or dry process. Long experience in design, construction, remodeling and operation. At present superintendent of a wet process plant. Desires change for greater responsibilities. University graduate, M. E. Married, age 49. References exchanged. If interested in a live wire, address

Box 1689, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

Situation Wanted

Manufacturing executive, thoroughly experienced in limestone products, structural steel fabrication and construction and the manufacture of paper, desires to make a permanent connection as manager, superintendent, secretary or similar capacity, with responsible concern. Address

Box 1690, care of Rock Products
542 South Dearborn Street Chicago, Illinois

FOR SALE

High grade argillaceous limestone deposit in commercial quantities in central Illinois. No competition.

Address Box 1686, Care of Rock Products
542 So. Dearborn St., Chicago, Ill.

POSITION WANTED

First class executive of long experience in erection and operation of stone crushing and sand plants seeks connection with proposition of merit as manager or superintendent; original ideas for production; references. Address

Box 1688, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

Graduate M. E. with thorough experience in construction, operation and industrial management. Able to design, erect, train operators and install an efficient system in a rotary kiln hydrate plant. Desires position as general manager in charge of engineering in cement or lime plant.

Address Box 1692, care Rock Products
542 South Dearborn Street Chicago, Illinois

FOR SALE

Eighty acres of high calcium limestone, located at Tyndall, Manitoba, Canada, 28 miles from Winnipeg, on the Canadian Pacific R. R. Unlimited market, a splendid opportunity for a lime manufacturer. For further particulars address

James Marr, 1316 L Street, Bedford, Ind.

Have you a plant for sale? Do you wish to purchase a plant? Are you in need of a superintendent or manager? Are you looking for a position as plant superintendent or manager? Advertise your wants in these columns for quick results.

Free Service to Readers of

Rock Products

If you are in the market for any kind of machinery, equipment or supplies, or if you desire catalogs, information or prices on any product, we are at your service—to obtain for you, without expense, catalogs, prices or specific information on every kind of machinery, equipment and supplies—or to help you find the hard to find source of supply.

RESEARCH SERVICE DEPARTMENT

ROCK PRODUCTS, 542 So. Dearborn St., Chicago, Illinois

Please send me catalogs and prices concerning the following items:

.....

.....

Name.....

Address.....

City..... State.....

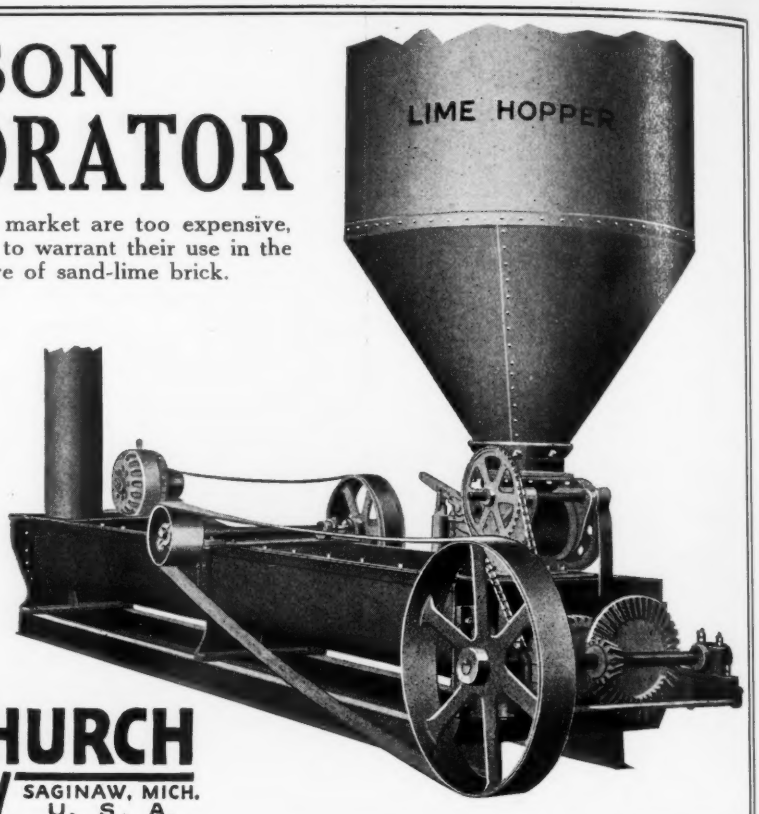
JACKSON
LIME HYDRATOR

The mechanical hydrators on the market are too expensive, both in first cost and operating cost, to warrant their use in the hydration of lime for the manufacture of sand-lime brick.

The Jackson was designed after several years of careful study and experiment. It is a perfect hydrator for the purpose, performing economically, and eliminating dust and gas.

After the lime is placed in the storage hopper, it is fed automatically into the differential hydrator where it is sprayed with the correct amount of water. Then it is mixed thoroughly, conveyed to the other end and from there to the silos where it is stored and the hydration completed, which takes from 12 to 24 hours.

By this method several cars of hydrated lime can be kept in stock without deterioration. The capacity of the hydrator illustrated is about fifteen tons per ten-hour day, requiring one man to unload lime from car, and one man to put in silo ready for use.



JACKSON & CHURCH Company
SAND LIME BRICK MACHINERY
SAGINAW, MICH. U. S. A.

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There's Extra Wear Built Into Every Indestructible Conveyor Belt

NEW YORK BELTING & PACKING CO. — FOUNDED 1846 INCORPORATED 1856

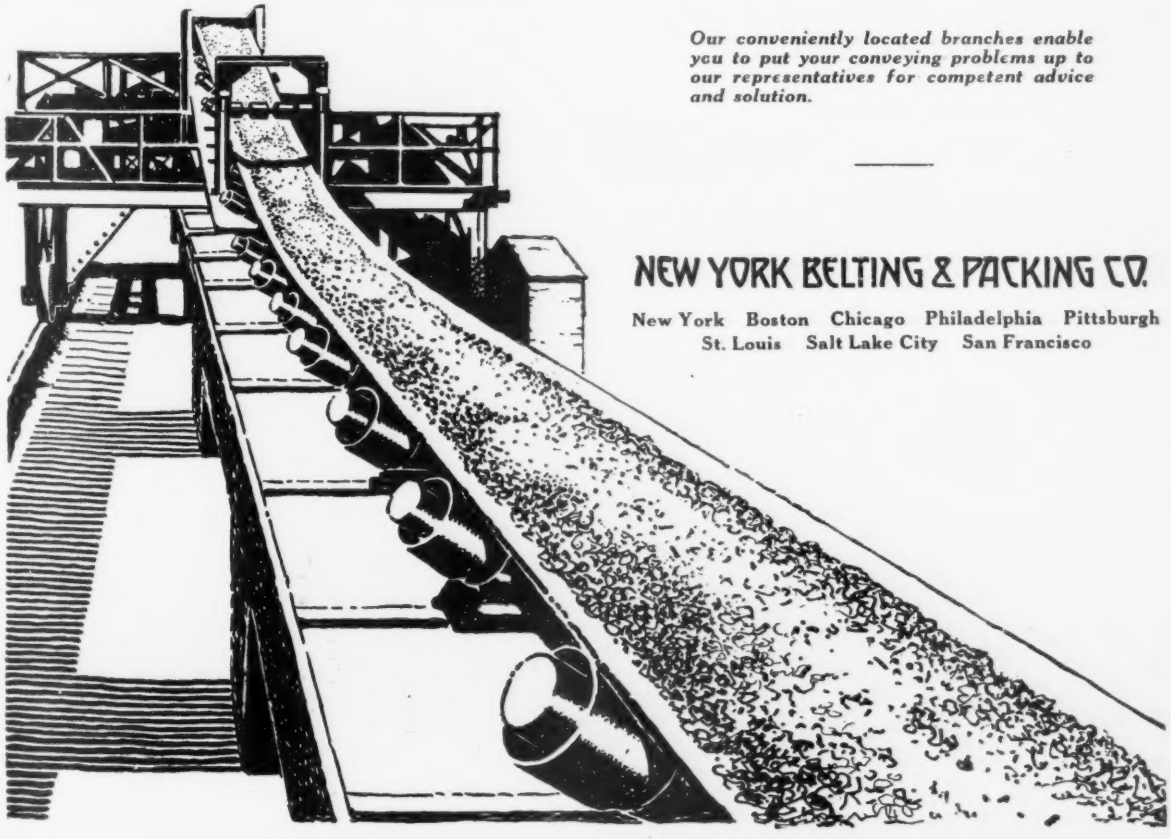
Rubber Goods for the Rock Products Industry

Indestructible Conveyor Belting
Inspiration Elevator Belting
Test Special Transmission Belting
Indestructible Air Drill Hose
Indestructible Water Hose
Indestructible Steam Hose
Fire Superheat Sheet Packing
Indestructible Sheet Packing
Cobbs Piston Packing
Pump Valves

It's the plus wear that counts—the wear beyond the ordinary length of useful life you expect of a conveyor belt. Extra tonnage carried over and above what may be reasonably efficient service, is the true test.

The thorough knowledge of quarrying conditions that enters into the planning of every Indestructible belt results in a type of wear-defying construction that comes through the test of heavy quarrying work with cost figures well on the credit side.

The correct weight and kind of duck in the right number of plies, bonded with a tenacious rubber friction and amply protected by a properly resistant rubber cover—these go to make up a conveyor belt possessing inherent quality.



Our conveniently located branches enable you to put your conveying problems up to our representatives for competent advice and solution.

NEW YORK BELTING & PACKING CO.

New York Boston Chicago Philadelphia Pittsburgh
St. Louis Salt Lake City San Francisco

The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

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These Makers of Cranes and Shovels

Bay City Dredge Works, Bay City, Mich.; Byers Machine Co., Ravenna, Ohio; Victor R. Browning, Cleveland, Ohio; Link Belt Co., Chicago, Ill.; Locomotive Crane Co. of America, Champaign, Ill.; Moore Speedcrane, Inc., Chicago, Ill.; Northwest Engineering Co., Green Bay, Wis.; Orton & Steinbrenner, Huntington, Ind., and others

Use CLIMAX

"The Trustworthy Engine"

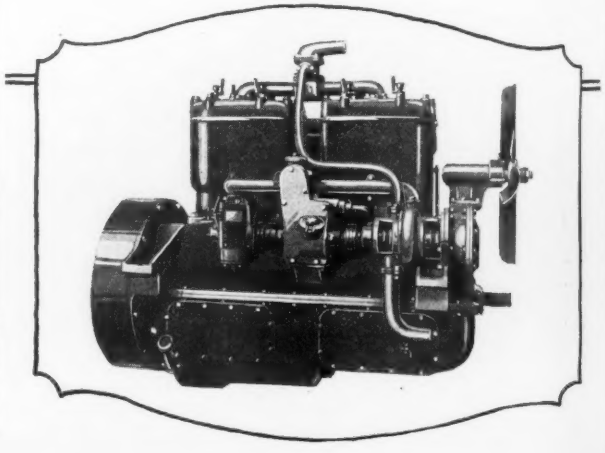
—as standard equipment in their cranes or shovels because careful tests have proven to them that No Other Engine gives the operator quite so much power with so little trouble and expense for operation and upkeep.

Let their experience be your guide.

Write for Catalog

Climax Engineering Company

22 W. 18th Ave., Clinton, Iowa



Dont's for the steam man~ ~and a don't for the gas man

Reprinted from Cement Mill & Quarry

For the steam man

"Don'ts" for the fireman which may all be listed under the heading, "Don't Forget"
The rules attached to the steam gage.
To look at the water gage or try the gage cocks when first starting to work.
To regulate the running speed of the boiler pump or injector to suit the requirements of an even water level. A constant feed is best if it can be so regulated.
Your regular times for firing and for cleaning fires. Don't allow holes to burn in the fire bed.
To try the safety valve every day.
Let ashes accumulate under the grate, choki burns the bars; have stated time for cleaning
To regulate the dampers and doors to pr an even rate of combustion; if automatic d are in use they should be examined often
To blow out the steam or water gag tion and the pressure gage connection needed to keep them free from obstr
To see the blow-off valve is cle

For the gas man

Don't forget to turn your engine off before going home at night

Northwest Engineering Co.
1234 Steger Building, Chicago

NORTHWEST

GAS or CRANES · SHOVELS · DRAGLINES ELECTRIC

When writing advertisers please mention ROCK PRODUCTS

McMyler-Interstate convertible

10-ton Crane

¾-yd. Shovel

The crane has a 30-ft., 35-ft., or 40-ft. boom and two power drums. The available line pull is 10,000 lbs.; for rapid bucket work, 6,000 lbs. With a quickly installed attachment, the crane will handle a ½-yard drag line bucket.

The shovel has a full ¾-yard dipper, 20-ft. boom and 16-ft. dipper stick. These convertible machines are equipped with a separate sluing engine and steam rams, enabling the change from crane to complete shovel to be made on the job in a minimum time.

In operation, design and construction, this machine is 100% crane when arranged for crane operation and 100% steam shovel when converted for shovel work.

As a crane or as a shovel, the mechanism constitutes a complete unit capable of performing its requisite tasks efficiently and economically.

Crawler tread, tractor wheels and railroad types available.

Locomotive Cranes · Pile Drivers · Derrick Cars · Car Dumpers

THE McMYLER-INTERSTATE CO. CLEVELAND

NEW YORK CHICAGO PITTSBURGH DETROIT

When writing advertisers please mention ROCK PRODUCTS

Without a Diving Suit

Not Even Hip Boots

They didn't need them. The Thew did the job in a matter of fact manner, as if wading the Cumberland were an every day duty.

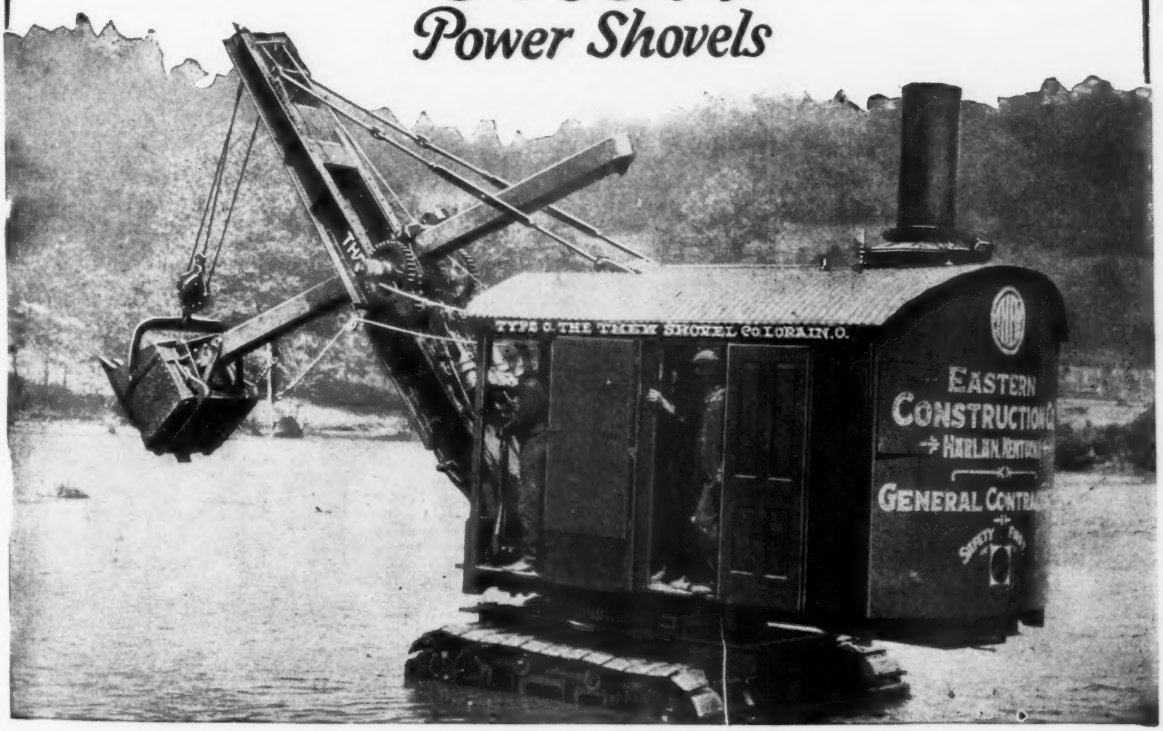
The shovel stepped right along, its treads clinging to the slippery, yielding bottom. The Thew Power Steer made it easy for the operator to handle it without leaving the cab and no one had to get down in the water to hook up any special mechanism.

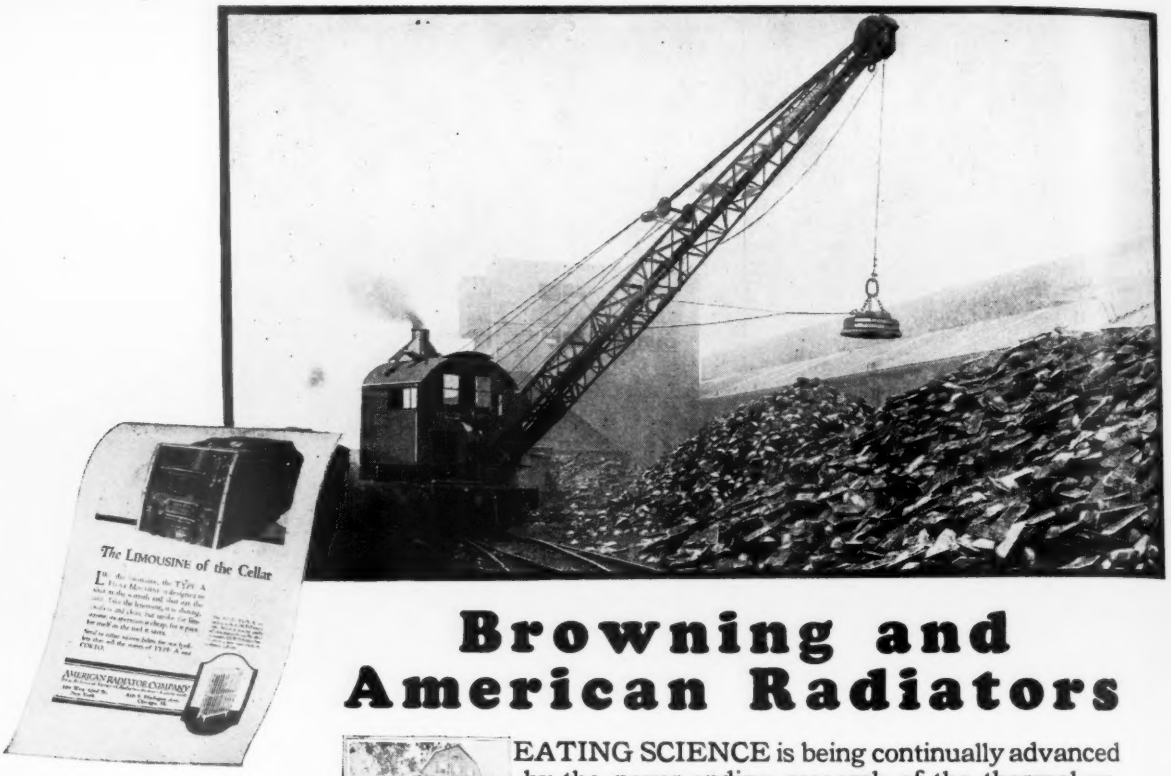
Because it out-digs the ordinary shovel on any job and meets just such emergencies as this without fuss or worry, the Thew fully justifies the confidence that owners and operators have in it.

After all these men are the best witnesses. Read what some of them have to say in Folder 523, out this month. Write for your copy if you miss it.

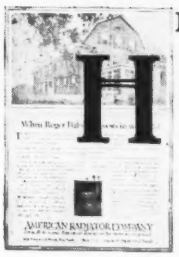
THE THEW SHOVEL COMPANY, LORAIN, OHIO

Thew
Power Shovels





Browning and American Radiators



HEATING SCIENCE is being continually advanced by the never-ending research of the thermal experts of the American Radiator Company. Definite performance standards for boilers and radiators are being constantly determined in their large laboratories devoted to the problems of better, economical warmth.

The same skill and painstaking care exercised in their thorough research work applies also to the fabrication of Ideal Boilers and American Radiators. No production detail is neglected which can give the public advanced heating at a reasonable cost.

We take justifiable pride in the fact that a Browning Locomotive Crane is used in bringing better warmth to the American public.

Many of our leading manufacturing concerns in all industries use Browning Locomotive Cranes to keep production costs at rock bottom. Whether your concern is large or small, if heavy material or coal handling is a factor, the Browning Crane will save money for you as it is doing for the American Radiator Company and hundreds of others.

Let our engineers investigate your needs and advise you frankly whether a Browning Locomotive Crane will pay you a profit.

THE BROWNING COMPANY

New York **CLEVELAND, OHIO, U. S. A.** **Chicago**

Sales Agents:

SEATTLE
PORTLAND
SALT LAKE CITY
LOS ANGELES
SAN FRANCISCO
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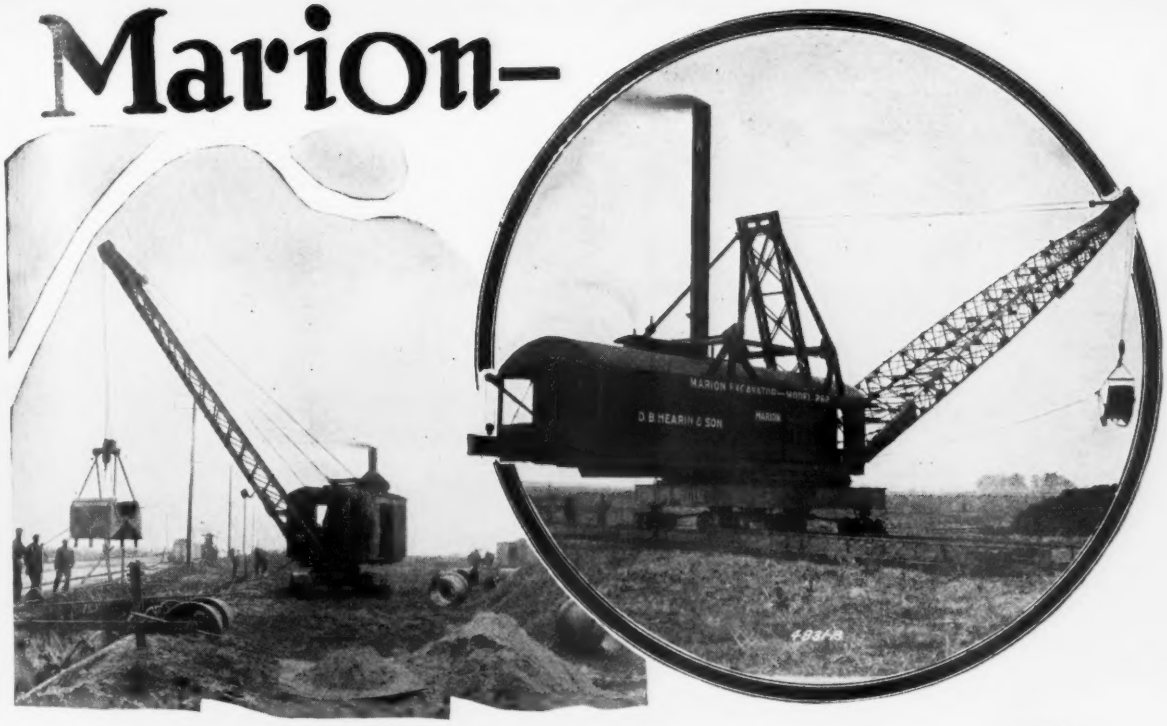
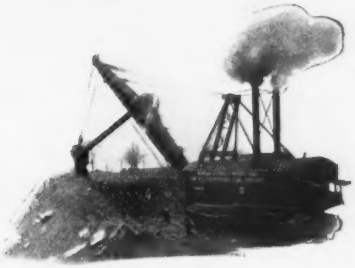
BROWNING
LOCOMOTIVE CRANES

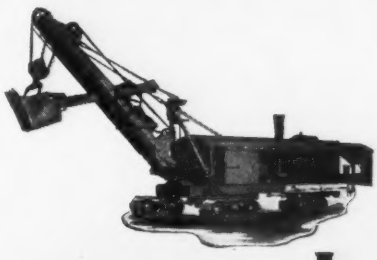
When writing advertisers please mention ROCK PRODUCTS

Marion–



Marion Excavating Machinery





Big jobs demand sturdy equipment. Good work requires good tools. That's one of the standard principles on which business operates today. In the excavating world, where big operations are put through economically and efficiently, there you will find Marions doing the most important work.

Marion Excavators are built with a clear and intelligent idea of what they are expected to do. They are prepared for heavy work before they are sent out—avoiding uncertainty and risk on the buyer's part. They are not limited to one size or for use on one kind of work. They are adapted to all kinds of excavating work.

The accompanying illustrations show typical methods ot grading, stripping, levee building and trench excavation. Other work is possible with the same machines. If these views do not suggest the right machine for your work get in touch with our engineers who will gladly give advice on the proper equipment.

Late bulletins on each type are just off the press. Your copies will be mailed promptly upon receipt of your request.

283

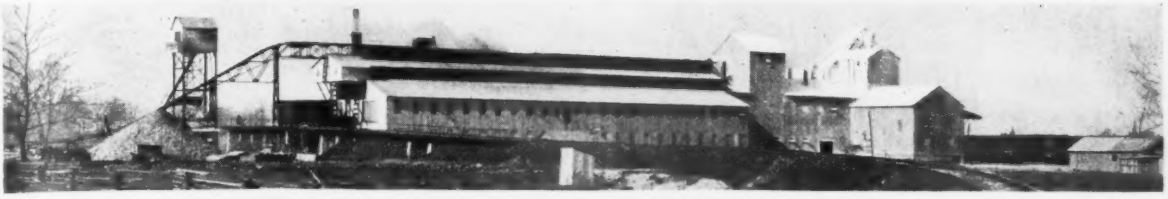
The Marion Steam Shovel Company

Marion Ohio.

Marion Crawler Trucks Make Hard Going Easy

NOTICE
TO
CONTRACTORS

The Missouri State Highway Commission, Jefferson City, Missouri, will receive bids until September 28th, 1923, for furnishing cement requirements for one, three and five years, beginning January 1, 1924. It will also receive bids at the same time for various plans for State assistance in financing and for erecting and operating cement plants within the State of Missouri. Full information may be obtained from the office in Jefferson City.



General view of plant of Ohio Hydrate & Supply Company

A Raymond Installation

One of the three Raymond Pulverizers is shown to the left and back of the Schaffer Hydrator

Twenty-five cents a ton is the total cost, including depreciation, interest, power, repairs and labor, to the Ohio Hydrate and Supply Company using Raymond Pulverizers, which takes their lime from the hydrator, grinds and air separates it, and delivers the finished product to the storage bin.

This concern installed the first two machines in their initial plant in 1917 and added a third during 1920. The three machines produce 14 tons per hour and operate 24 hours a day, 306 days a year.

Raymond Pulverizers equipped with Air Separation, do three things in handling the lime between the Hydrator and finished product bin.

FIRST:—They beat up the lime, distributing the moisture more evenly throughout, and tending to complete hydration—

SECOND:—This beating action separates the impurities like core, sand, and unburnt lime, eliminating them from the beater chamber through a throwout attachment—

AND THIRD:—The ground material is classified into a fine powder and delivered direct to a storage bin without dust or the use of an elevator.

Raymond Equipment will perform the same for you, producing a finished material in the best possible condition for use in both the building and chemical industries as well as for agricultural purposes.

You will find the cost per ton far less than by the use of screens or any other method and you will have a superior product to market.

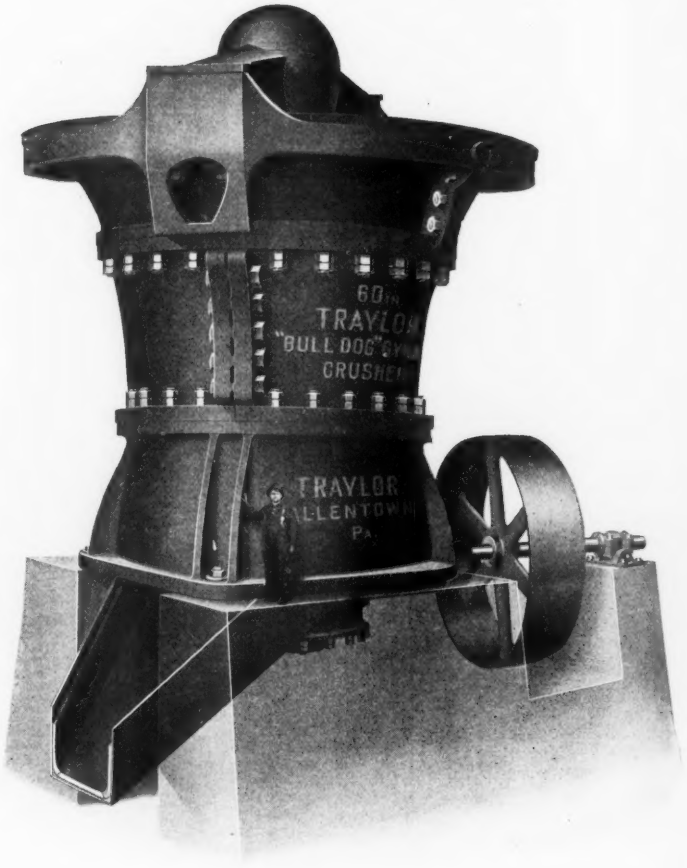
Raymond Bros. Impact Pulverizer Co.

1301 N. BRANCH ST. CHICAGO, ILL.

Eastern Office, 50 Church St., NEW YORK CITY
Western Office, 1002 Washington Bldg., LOS ANGELES

SOME OF MANY
"BULLDOG" USERS

Anaconda Copper Co.
Bethlehem Mines Corp.
Bound Brook Crushed Stone Co.
Casparis Stone Co.
Cerro de Pasco Mining Co.
Chicago Union Lime Works
Chicago Gravel Co.
Dolese Bros.
El Paso & Southwestern R. R.
Empire Gypsum Co.
Dan Evans Stone Co.
G. W. Focht Stone Co.
W. R. Grace & Co.
Geo. J. Hoffman & Co.
Iron Mountain Co.
Lehigh Portland Cement Co.
Morris County Crushed Stone Co.
New York Trap Rock Co.
Northern Pacific Railway Co.
Oakfield Gypsum Co.
Phoenix Portland Cement Co.
Rock Cut Stone Co.
Superior Portland Cement Co.
Universal Portland Cement Co.



The World's Largest Crusher Is a Bulldog Gyratory

TRAYLOR
ENGINEERING AND MFG. CO.
ALLENTOWN, PA.

NEW YORK 30 Church St. | PITTSBURGH 1203 Fulton Bldg. | CHICAGO 1414 Fisher Bldg. | LOS ANGELES I. W. Hellman Bldg. | SEATTLE 815 Alaska Bldg. | SALT LAKE CITY 101 W. 2nd South St. | LAREDO, TEXAS 1806 Farragut Ave.

TIMMINS, ONTARIO, CANADA, Moore Block

Export Department, 104 Pearl Street, New York City—Cable Address "Forsaltra"

International Machy. Co., Santiago, Chile | **W. R. Grace & Co., Lima, Peru** | **International Machy. Co., Rio de Janeiro, Brazil**

The Phoenix Portland Cement Company

Birmingham, Ala.

Like many other progressive cement manufacturers installed

The New Gear-Driven

BRADLEY HERCULES MILL

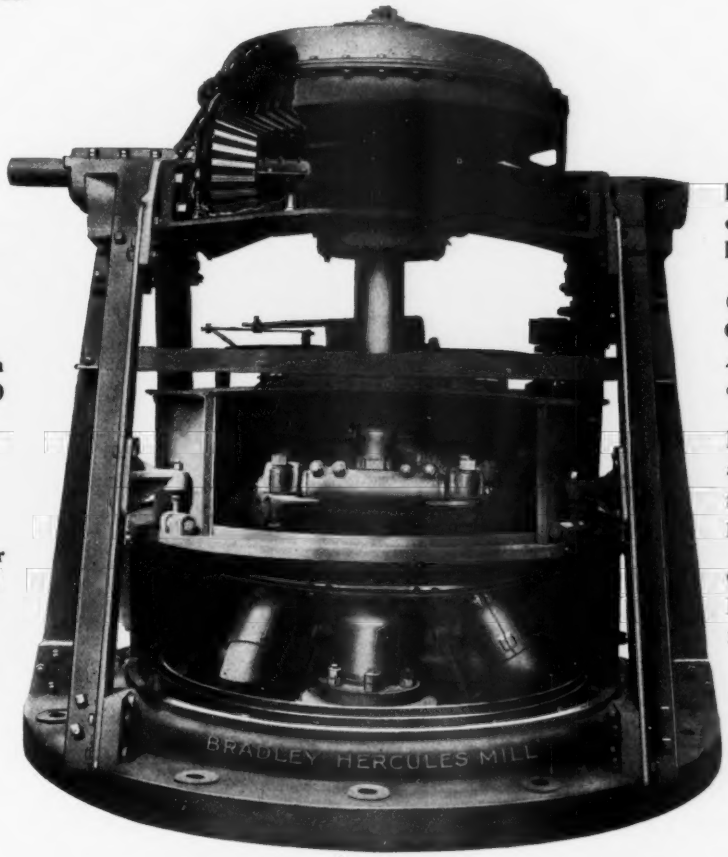
No other preliminary pulverizer can equal its performance. Produces in connection with the Tube Mill an unexcelled cement at the lowest possible cost for Power and Maintenance. This new HERCULES MILL is being taken up by many of America's most successful cement companies.

Raw Material 35-50 tons per hour

Fineness 50 - 60% through 100, all through 20

250-300 Horse-power

Clinker 120-175 bbls. per hour, 50-60% through 100



Largest output machine on the market.

Clean, Dustless, Quiet, Economical. All a good machine should be.

Increases output of any Tube Mill by giving this unit the proper feed.

Only semi-fine Preliminary Machine manufactured.

There must be some big real reason why the following manufacturers have adopted the HERCULES MILL

Lehigh Portland Cement Co.
Marquette Cement Mfg. Co.
Giant Portland Cement Co.
National Cement Co.
Crescent Portland Cement Co.
Universal Portland Cement Co.
International Cement Corp.
Lawrence Portland Cement Co.
Superior Portland Cement Co.
Knickerbocker Portland Cement Co.
Alpha Portland Cement Co.
Dexter Portland Cement Co.
Clinchfield Portland Cement Co.
Coplay Cement Mfg. Co.
Gilmore Cement Corp.

and many others

Bradley Pulverizer Co.

Boston London Works, Allentown, Pa.

26th ANNUAL CONVENTION

of the

AMERICAN MINING CONGRESS

The National Exposition of Mines and Mining Equipment

THE EXPOSITION

150 exhibits, many in operation, of practically every essential machine and device used in either coal or metal mining.

Exhibits by U. S. Government Departments, foreign countries, states, mine schools.

Government-made moving pictures of several important types of mining.

Safety and rescue work demonstrated with latest and most modern equipment.

THE CONVENTION

The TWENTY-SIXTH ANNUAL meeting of the AMERICAN MINING CONGRESS to formulate a Constructive Program for the Mining Industry.

Topics Under Discussion

Industrial Co-operation—To secure industrial peace.

Selective Immigration—To maintain industrial progress.

Dangerous Paternalism — To prevent Nationalization of Industry.

Intelligent Conservation—To develop Natural Resources.

Wise Taxation — To safeguard the Mining Industry.

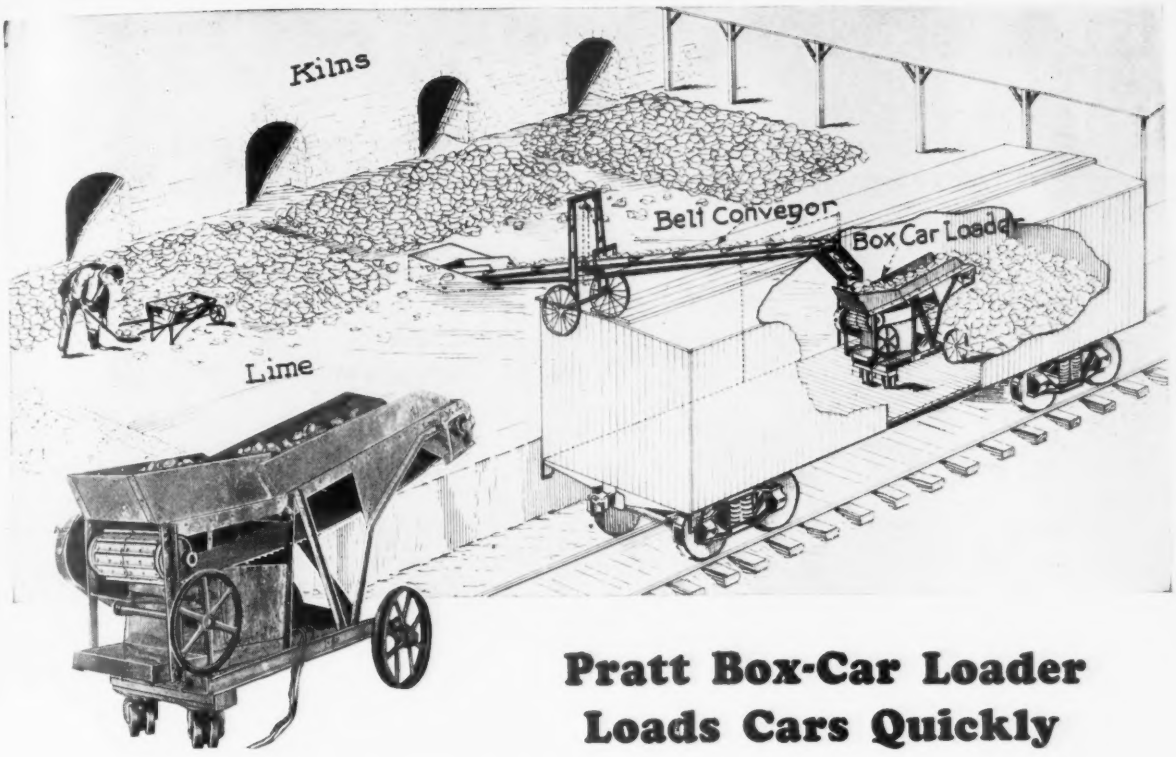
Standardization—To increase mine efficiency.

PUBLIC AUDITORIUM

AT MILWAUKEE

SEPTEMBER 24th to 29th

CONVENTION HEADQUARTERS, HOTEL WISCONSIN, MILWAUKEE, WIS.



Pratt Box-Car Loader Loads Cars Quickly

Let your wheelbarrow men dump their loads to a portable belt conveyor, one end of which has been pushed into the car door, and let one of our Pratt Box-Car Loaders throw the material properly, back into the ends of the car.

Do you see the saving, the ease of operation? The machinery will take the material away as fast as the men can bring it with wheelbarrows. The wheelbarrows stay on the floor, and do not have to be pushed up hill into the car. The men load faster. It takes fewer men. The power and maintenance are negligible.

While this illustration shows the operation in loading lime, a practical arrangement can be made for handling your material, no matter what it may be. Pratt Box-Car Loaders are suitable for loading sand, salt, phosphate rock, marl, sulphur, cement clinker, lump lime, ores, acid phosphate, limestone, ground lime, fertilizer and similar materials.

Get full particulars—Return the Coupon today K08

LINK-BELT COMPANY, 2045 HUNTING PARK AVE., PHILADELPHIA, PA.

Please send full particulars regarding the Pratt Box-Car Loader. We are interested in a machine to handle _____.

Name _____ Firm _____

Address _____ Town _____

R. P.

LINK-BELT

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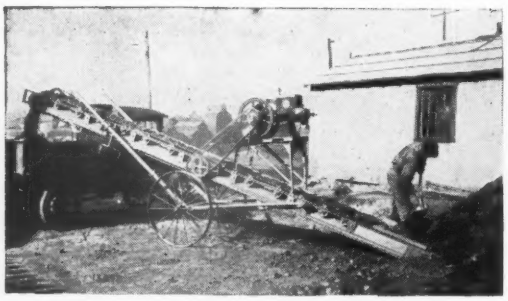
Isn't This Wasteful Extravagance?



The strong, sharp nose of the Jeffrey Portable Conveyor can be readily thrust into pile

Unloading direct from hopper bottom car to truck

WITH the present shortage of man power, and the demand for greater production at lower costs, wasteful extravagance exists wherever men are doing work which can be done quicker and cheaper by mechanical means.

One man and a Jeffrey Portable Belt Conveyor can load a 5-ton truck in 10 minutes. Doing this by hand takes 3 men, 40 minutes, and your truck and driver are idle for this period. The saving is obvious.

The Jeffrey Portable Belt Conveyor handles coal, coke, sand, gravel, crushed stone, and other loose materials — unloads cars — handles brick, tile, small boxes and bags.

Troughed Belt carries gritty material without injury to belt. An easily operated Worm and Wheel Raising and Lowering Device Automatically locks Conveyor in any position.

Write for prices and further information

The Jeffrey Manufacturing Company

935-99 North Fourth Street, Columbus, Ohio

New York..2008 Hudson Terminal Bldg.
Chicago.....858 McCormick Bldg.
Cincinnati.....62 Plum St.
Philadelphia, 515 Real Est. Tr. Bldg.
Pittsburgh, Rea Bldg., 622 2nd Ave.
Montreal, Canada.....Power Bldg.

Locations of Other Jeffrey Sales Representatives

Scranton, Pa.....518 Union Nat'l Bank Bldg.

Cleveland, O.....1519 Guardian Bldg.
Denver, Colo.....1751 Wazee St.
St. Louis, Mo.....606 Pontiac Bldg.
Detroit, Mich.....455 Book Bldg.
Milwaukee, Wis.....M. & M. Bldg.
Boston, Mass.....141 Milk St.
Los Angeles, Cal.....
.....H. W. Heilman Bldg.
Charleston, W. Va...914 Kanawha St.

JEFFREY
MATERIAL HANDLING MACHINERY

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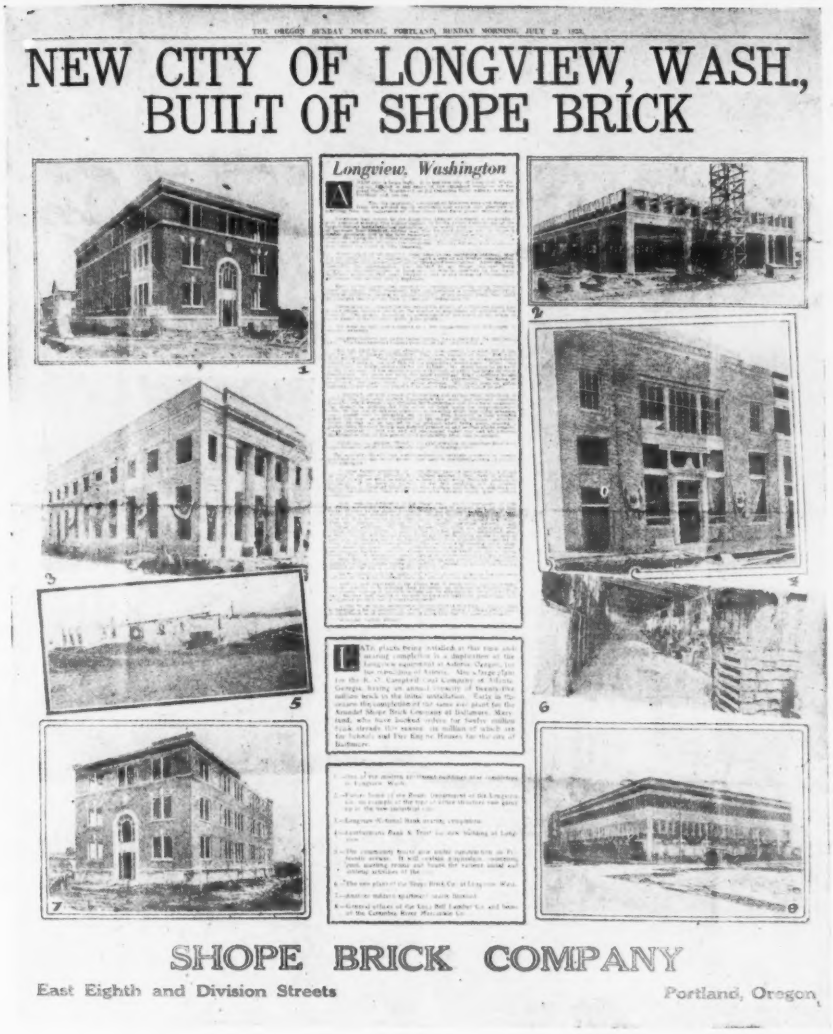

NEW CITY OF LONGVIEW, WASH., BUILT OF SHOPE BRICK
Longview, Washington
SHOPE BRICK COMPANY
East Eighth and Division Streets
Portland, Oregon

QUALITY
BEAUTY
UTILITY

IMPERVIOUS
FIRE
RESISTING

The above reprint from our advertisement in the Oregon Sunday Journal, Portland, Oregon, tells a wonderful story of the new city—Longview, Washington—that is now being built on the Columbia River, midway between Portland and the Sea.

It is a city conceived and designed by Engineers. There is a Shope Concrete Brick plant with an annual capacity of ten million bricks now in operation, and as can be seen from the photographs, Shope Bricks are being used in large quantities.

Shope Brick are now being manufactured in many of the principal cities in our twenty states. It is a business that guarantees a living profit under machinery and process patents. The purchaser of territorial rights is always protected as no two plants are allowed to compete.

Common Brick

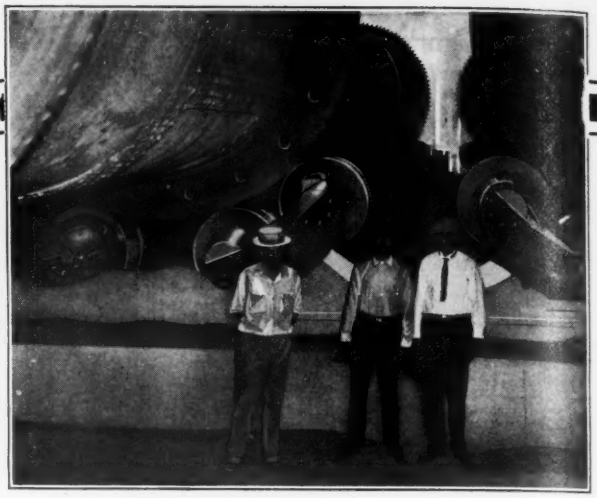
SHOPE BRICK COMPANY

PORTLAND, OREGON

Face Brick

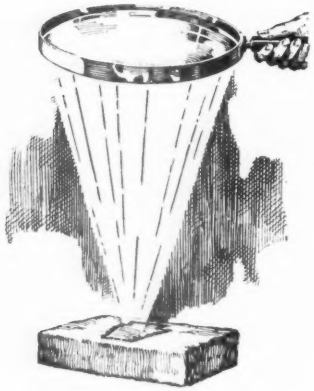
Concrete for Permanence

High Heat Resisting—High Lubricating and Friction Reducing Value



A section of the Kiln Room, taken from the extreme hot end of the Kilns and showing the first line of bearings

IN KEYSTONE-KEYSO Greases we are offering a formula which is a remarkable step forward in the development of efficient lubrication of machinery operating under high heat conditions. They combine all the necessary heat resisting properties with a high lubricating value and efficiency. Their use under the severest working conditions of heat have not resulted in decomposition or waste, but, on the contrary, the grease has held in bearings where other lubricants have given little or no satisfaction.



Send for Booklet describing Keystone-Keyso High Melting Point Greases.

Keystone-Keyso

High Melting Point Grease

has been developed after considerable laboratory and practical service research work, and is now in use in many representative American industries giving more economical and efficient service.

Keystone-Keyso Grease is manufactured in seven densities, from light cup grease to heavy brick form, but it is emphasized that the melting points of the various densities are practically identical. The selection of one in preference to another should be based only on mechanical conditions to meet preferable and necessary methods of application, without regard to conditions of varying heat.

THE KEYSTONE LUBRICATING CO.

New York
Boston
Pittsburgh
Chicago
Detroit
Denver
St. Louis
Knoxville

Executive Office and Works
21st and Clearfield Streets
Philadelphia, Pa.
Established 1884

San Francisco
Minneapolis
Montgomery, W. Va.
Kansas City
Memphis
Omaha
Tulsa, Okla.
Cincinnati
New Orleans

Agencies in Principal Countries Throughout the World

KEYSO
TRADE MARK
REG. U.S. PAT. OFF.
GREASE

When writing advertisers please mention ROCK PRODUCTS

Concrete road contractors find the 3 to 4-ton Austin Pup Roller in a class by itself when it comes to rolling subgrade.

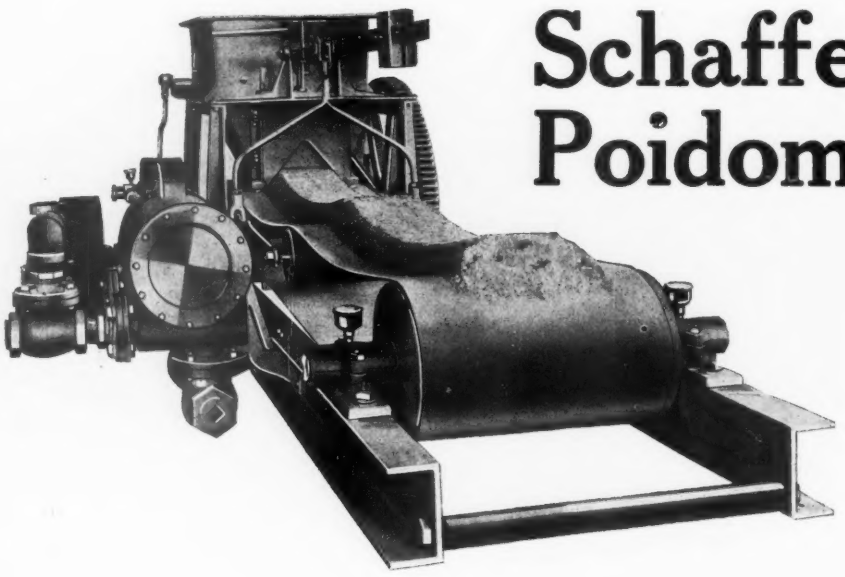
Compact and easy to handle between the forms; costing little to buy, and next to nothing to maintain; The Pup is a saver of time, labor, expense; and, last but not least, of the concrete that would otherwise go to fill the ruts made by the wheels of trucks, and other irregularities.

A special catalog tells the whole story of the Austin Pup, and its many uses as a handy roller, scarifier and road maintainer. Your copy is ready.

The Austin-Western Road Machinery Co.

Home Office: Chicago

Branches in Principal Cities



Schaffer Poidometers

Proportion Raw Materials at the New Plant of the Phoenix Portland Cement Co.

In the selection of equipment for this plant, conceded to be the most modern "dry process" cement plant, two Schaffer Poidometers were chosen for proportioning stone and shale.

The experiences of the Phoenix Portland Cement Co. with its No. 1 plant at Nazareth, Pa., guided it in selecting the best and most efficient equipment.

The fact that Schaffer Poidometers have been installed, after all their experience, is a fine commentary on the efficiency reputation of our machine.

Years of operation in service has demonstrated the remarkable efficiency and economy of the Schaffer Poidometer, and it is acclaimed the standard of its class.

Complete Details and Performance Records at Other Plants Available for Your Use

SCHAFFER ENGINEERING & EQUIPMENT CO.
2828 Smallman Street **Pittsburgh, Pa.**